EPA/ROD/R03-91/109
1991

EPA Superfund
Record of Decision:

WHITMOYER LABORATORIES
EPA ID: PAD003005014
OU 03
JACKSON TOWNSHIP, PA
12/31/1990

Text:
ALL TREATED
SOILS; THE GROUNDWATER TREATMENT RESIDUALS; AND THE
DEMOLITION DEBRIS THAT IS NOT SALVAGED.

THE SELECTED REMEDY IS THE LAST OF SEVERAL PHASES IN THE LONG-TERM REMEDIATION OF THIS SITE AND WILL BE CONSISTENT WITH PREVIOUSLY SELECTED SITE REMEDIES.

IT MAY POTENTIALLY PROVE TECHNICALLY IMPRACTICABLE TO ACHIEVE THE HEALTH-BASED GROUNDWATER CLEANUP GOALS UNDER THE SELECTED REMEDY FOR THE GROUNDWATER. IF INFORMATION EMERGES FROM THE OPERATION OF THE SELECTED REMEDY SYSTEM THAT STRONGLY SUGGESTS THAT IT IS TECHNICALLY IMPRACTICABLE TO ACHIEVE THE CLEANUP GOALS THROUGHOUT THE CONTAMINATED GROUNDWATER PLUME BECAUSE OF AN OBSERVED "LEVELING-OFF" OF CONTAMINANT CONCENTRATIONS, THE EPA, IN CONSULTATION WITH THE COMMONWEALTH OF PENNSYLVANIA, INTENDS TO IMPLEMENT A CONTINGENT REMEDY IN THOSE AREAS WHERE THE CLEANUP GOALS WILL NOT BE MET. THE CONTINGENT REMEDY IS SIMILAR TO THE SELECTED REMEDY, WITH THE EXCEPTION THAT GROUNDWATER WOULD ONLY BE EXTRACTED IN SUFFICIENT QUANTITIES TO KEEP THE NON-ATTAINMENT AREA FROM GROWING.

STATUTORY DETERMINATIONS

BOTH THE SELECTED REMEDY AND THE CONTINGENCY REMEDY ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, AND ARE COST-EFFECTIVE. EPA BELIEVES THAT BOTH THE SELECTED AND CONTINGENT REMEDIES WILL MEET ALL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS WITH THE SOLE EXCEPTION OF THE STATE ACTION-SPECIFIC REQUIREMENT TO REMEDIATE GROUNDWATER TO BACKGROUND CONCENTRATIONS. ACCORDINGLY, I HEREBY WAIVE THE PROVISIONS OF 25 PA CODE, CHAPTER 75, PART 264 WITH RESPECT TO GROUNDWATER BACKGROUD CONCENTRATIONS DUE TO TECHNICAL IMPRACTICABILITY. BOTH REMEDIES UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE AND SATISFY THE STATUTORY PREFERENCE FOR REMEDIES WHICH EMPLOY TREATMENT THAT REDUCES TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT.

BECAUSE BOTH THE SELECTED REMEDY AND THE CONTINGENCY REMEDY FOR THE THIRD OPERABLE UNIT WILL RESULT IN HAZARDOUS SUBSTANCES REMAINING ONSITE ABOVE HEALTH-BASED LEVELS, A REVIEW UNDER SECTION 121(C) OF CERCLA, 42 USC 9621(C) WILL BE CONDUCTED WITHIN FIVE YEARS AFTER THE COMMENCEMENT OF REMEDIAL ACTION TO ENSURE THAT THE REMEDY CONTINUES TO PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

EDWIN B. ERICKSON DATE: 12/31/90
REGIONAL ADMINISTRATOR

#SNLD
I. SITE NAME, LOCATION, AND DESCRIPTION

A. SITE NAME AND LOCATION

THE WHITMOYER LABORATORIES SITE (SITE) IS LOCATED ON APPROXIMATELY 22 ACRES IN JACKSON TOWNSHIP, LEBANON COUNTY, PENNSYLVANIA, ABOUT 1 MILE SOUTHWEST OF THE BOROUGH OF MYERSTOWN (SEE FIGURES 1 AND 2). THE SITE LIES BETWEEN THE UNION CANAL OF TULPEHOCKEN CREEK AND THE CONRAIL (READING) RAILROAD. FAIRLANE AVENUE FORMS THE SITE'S EASTERN BOUNDARY, WHILE CREAMERY STREET ADJOINS THE SITE TO THE WEST.

A FOOD STORAGE WAREHOUSE IS ACTIVE IN BUILDING 18 ON THE SITE. LAND SURROUNDING THE SITE IS PREDOMINANTLY FARMLAND, WITH SCATTERED FARMHOUSES. A STERLING DRUG FACTORY IS LOCATED 2,000 FEET EAST OF THE SITE, WHILE PJ VALVES, A MANUFACTURING PLANT, IS LOCATED ABOUT 1,500 FEET TO THE SOUTH. A LARGE ACTIVE LIMESTONE QUARRY, LOCALLY REFERRED TO AS THE CALCITE QUARRY, IS LOCATED APPROXIMATELY 1.5 MILES WEST OF THE SITE.

B. TOPOGRAPHY, SURFACE WATER, AND DRAINAGE

TOPOGRAPHIC RELIEF ON THE SITE IS MODERATE, VARYING IN ELEVATION FROM 493 FEET IN THE SOUTHWEST CORNER TO 449 FEET IN THE NORTHEAST CORNER. THE ENTIRE SITE DRAINS TO TULPEHOCKEN CREEK, WITH DRAINAGE BEING ROUGHLY PERPENDICULAR TO THE CREEK AXIS. PORTIONS OF THE SITE ARE WITHIN THE 100-YEAR FLOOD PLAIN OF TULPEHOCKEN CREEK-UNION CANAL.

THE UNION CANAL BRANCHES FROM TULPEHOCKEN CREEK JUST WEST OF THE SITE AND REJOINS THE CREEK NEAR THE SITE'S EASTERN BOUNDARY. MYERSTOWN IS THE FIRST DOWNSTREAM COMMUNITY, AT A DISTANCE OF APPROXIMATELY 3/4TH OF A MILE. TULPEHOCKEN CREEK IS A TRIBUTARY TO AND JOINS THE SCHUYLKILL RIVER NEAR READING, PENNSYLVANIA. THE SCHUYLKILL RIVER FLOWS INTO THE DELAWARE RIVER, WHICH EVENTUALLY EMPTIES INTO THE ATLANTIC OCEAN. TULPEHOCKEN CREEK AND THE SCHUYLKILL RIVER SERVE AS DRINKING WATER SUPPLIES AND IRRIGATION SOURCES DOWNSTREAM OF THE SITE. THE HEADWATERS OF THE SECTION OF TULPEHOCKEN CREEK WHICH PASSES BY THE SITE ORIGINATE APPROXIMATELY 3 MILES TO THE NORTHWEST.

C. GEOLOGY

THE WHITMOYER LABORATORIES SITE IS LOCATED WITHIN THE LEBANON VALLEY, PART OF THE GREAT VALLEY PORTION OF THE VALLEY AND RIDGE PHYSIOGRAPHIC PROVINCE. THE VALLEY IS A TOPOGRAPHIC EXPRESSION OF THE UNDERLYING, RELATIVELY EASILY ERODED CARBONATE BEDROCK UNITS. THE SITE IS UNDERLAIN BY CARBONATE BEDROCK OF THE ONTELAUNEE FORMATION, THE YOUNGEST MEMBER OF THE ORDOVICIAN AGE BEEKMANTOWN GROUP. A THIN MANTLE OF CLAYEY RESIDUAL SOIL OVERLIES BEDROCK IN THE SITE VICINITY. DEPTHS TO BEDROCK IN THE SITE VICINITY RANGE FROM 0-19 FEET, BASED ON THE REMEDIAL INVESTIGATION (RI). THE DEPTH TO BEDROCK IS GREATEST IN THE VICINITY OF TULPEHOCKEN CREEK AND THE UNION CANAL.

THE ONTELAUNEE FORMATION IS DESCRIBED IN REGIONAL LITERATURE AS A LIGHT TO DARK GRAY DOLOMITE, WHICH WEATHERS TO A DARK GRAYISH BROWN. THE ONTELAUNEE FORMATION STRIKES NORTH 60 DEGREE EAST TO NORTH 80 DEGREE EAST PREDOMINANTLY, WITH AN OVERALL DIP TO THE SE OF APPROXIMATELY 30 DEGREE IN THE MYERSTOWN AREA, THIS FORMATION IS APPROXIMATELY 500 FEET THICK.

SOILS IN THE AREA ARE PRIMARILY RESIDUAL SOILS DERIVED FROM WEATHERING OF THE BEDROCK SURFACE, WITH SOME ALLUVIUM ADJACENT TO TULPEHOCKEN CREEK. BASED ON THE RI, THE SOILS CONSIST PREDOMINANTLY OF SILT AND CLAY. A THIN VENEER OF ORGANIC-RICH TOPSOIL OVERLIES THE RESIDUAL SOILS THROUGHOUT MUCH OF THE AREA. FILL MATERIAL IS PRESENT IN SEVERAL LOCATIONS WITHIN THE SITE PROPERTY BOUNDARIES.

D. HYDROGEOLOGY

THE CARBONATE BEDROCK UNITS UNDERLYING THE LEBANON VALLEY FORM THE MAJOR AQUIFER IN THE AREA. THE VARIOUS FORMATIONS PRESENT, ALTHOUGH DIFFERING SOMEWHAT IN WATER-YIELDING CAPACITY, ARE CONSIDERED TO FORM A SINGLE, LARGE, HETEROGENEOUS, UNCONFINED AQUIFER. THE POROSITY OF THE CARBONATE AQUIFER IS ALMOST ENTIRELY SECONDARY, WITH FRACTURES ENLARGED THROUGH SOLUTION CHANNELING FORMING THE PRIMARY GROUNDWATER STORAGE ZONES AND MIGRATION PATHWAYS.

GROUNDWATER FLOW DIRECTIONS IN THE REGION GENERALLY FOLLOW TOPOGRAPHY, THEN FOLLOW STREAM FLOW DIRECTION IN VALLEY BOTTOMS. IN THE SITE AREA, PORTIONS OF THE GROUNDWATER FLOW BOTH IN NORTHEASTERLY AND SOUTHEASTERLY DIRECTIONS, BEFORE GENERALLY FOLLOWING THE COURSE OF THE STREAM TO THE EAST-NORTHEAST. DEPTH TO GROUNDWATER RANGES FROM 2 TO 21 FEET BELOW LAND SURFACE AT THE SITE.

RECHARGE TO GROUNDWATER IN THE CARBONATE ROCK UNITS IS PRINCIPALLY THROUGH PRECIPITATION INFILTRATION, WITH ADDITIONAL RECHARGE DUE TO GROUNDWATER MIGRATION FROM ADJACENT ROCK UNITS, AND OCCASIONAL SURFACE WATER RECHARGE DURING EXTENDED DRY PERIODS.

GROUNDWATER BENEATH THE SITE IS CLASSIFIED AS A CLASS 2A AQUIFER, A CURRENT SOURCE OF DRINKING WATER. THE GROUNDWATER IS USED FOR BOTH POTABLE AND INDUSTRIAL WATER SUPPLIES. APPROXIMATELY 40 RESIDENCES IN THE SITE VICINITY HAVE POTABLE WATER SUPPLY WELLS TAPPING THE AQUIFER. TWENTY OF THESE RESIDENCES HAVE BEEN PLACED ON BOTTLED WATER BY EPA DUE TO CONTAMINATION OF THEIR WATER SUPPLY FROM THE SITE ACTIVITIES. LARGE INDUSTRIAL USERS OF GROUNDWATER INCLUDE STERLING DRUG, INC., QUAKER ALLOY CASTING CO., AND P.J. VALVES COMPANY.

THE MYERSTOWN WATER AUTHORITY (AUTHORITY) PROVIDES POTABLE WATER TO THE RESIDENTS OF MYERSTOWN. ONE OF THE AUTHORITY'S RESERVE WELLS, NO. 8, TAPS THE BEDROCK AQUIFER UNDERLYING THE SITE. THIS WELL IS UTILIZED DURING PERIODS OF HIGH DEMAND. TO DATE, CONTAMINATION FROM THE SITE HAS NOT BEEN DETECTED IN THIS WELL.

AN EXTENSION TO THE MYERSTOWN WATER AUTHORITY'S WATER LINE HAS BEEN DESIGNED BY EPA FOR THOSE RESIDENTS IN THE VICINITY OF THE SITE WHOSES WELLS HAVE BEEN SHOWN TO CONTAIN ARSENIC CONTAMINATION. THE WHITMOYER LABORATORIES PRIVATE STUDY GROUP (WLPSG), A GROUP OF FORMER SITE OWNERS, HAVE ENTERED INTO A CONSENT AGREEMENT WITH EPA TO PROVIDE FOR THE CONSTRUCTION OF THIS EXTENSION.

E.CLIMATOLOGY

THE WHITMOYER LABORATORIES SITE IS LOCATED WITHIN THE SOUTHEASTERN PIEDMONT CLIMATOLOGICAL DIVISION OF PENNSYLVANIA. SECOND MOUNTAIN, WHICH RISES 1,500 FEET ALONG THE NORTH BORDER, AND SOUTH MOUNTAIN, WHICH RISES 1,000 FEET ALONG THE SOUTHERN BORDER, FORM THE LEBANON VALLEY, IN WHICH THE SITE IS LOCATED. THE LEBANON VALLEY HAS A HUMID CONTINENTAL CLIMATE. DUE TO THE VALLEY'S LOCATION, WEATHER SYSTEMS ARE TYPICALLY MODIFIED BEFORE REACHING LEBANON COUNTY. WEATHER EXTREMES ARE MOST OFTEN THE RESULT OF UNUSUALLY STRONG WEATHER SYSTEMS.

THE AVERAGE ANNUAL PRECIPITATION AT THE SITE IS 42.3 INCHES. THIS PRECIPITATION IS MOSTLY EVENLY DISTRIBUTED THROUGHOUT THE YEAR, WITH SLIGHTLY LESS PRECIPITATION OCCURRING IN THE WINTER. THE AVERAGE ANNUAL SNOWFALL IS 27 INCHES. EVAPORATION AT THE SITE IS 36.3 INCHES; THUS, NET PRECIPITATION IS 6 INCHES.

IN THE SUMMER, HIGH TEMPERATURES ARE GENERALLY IN THE MID-80S AND THE LOWS NEAR 60 FAHRENHEIT. DURING THE WINTER THE HIGHS AVERAGE IN THE UPPER 30S AND THE LOWS IN THE 20S. THE PREVAILING WIND IS FROM THE NORTHWEST IN WINTER AND FROM THE WEST-SOUTHWEST IN SUMMER.

F. POPULATION AND ENVIRONMENTAL RESOURCES

LEBANON COUNTY, ACCORDING TO THE 1980 CENSUS, HAS A POPULATION OF

109,829, AND IS CLASSIFIED BY THE COMMONWEALTH OF PENNSYLVANIA AS A "5TH CLASS" COUNTY. THE POPULATION OF MYERSTOWN IN 1984 WAS 3,270. POPULATIONS OF 1,296 AND 4,683 RESIDE WITHIN 1 AND 3 MILES OF THE SITE, RESPECTIVELY.

PORTIONS OF TULPEHOCKEN CREEK (CREEK) ADJACENT TO THE SITE CONTAIN VERY SMALL OPEN WATER WETLANDS AREAS CONSISTING OF SMALL POCKETS ALONG THE RIVERINE SYSTEM OF THE CREEK AND UNION CANAL. FLOODPLAIN FOREST WETLANDS EXIST STARTING APPROXIMATELY 3.5 MILES DOWNSTREAM OF THE SITE. THE AREA HAS SOME HABITAT VALUE, WITH OPOSSUM, RACCOON, NUMEROUS FISH, A WATER SNAKE, AND VARIOUS SONGBIRDS OBSERVED DURING A 1986 EPA SITE VISIT.

TULPEHOCKEN CREEK HAS BEEN PROPOSED FOR INCLUSION ON THE COMMONWEALTH OF PENNSYLVANIA'S SCENIC RIVER SYSTEM, WITH A "PRIORITY 1A STATUS." THIS DESIGNATION IS FOR STREAMS WHICH "HAVE THE MOST URGENT NEED FOR PROTECTION AND IMMEDIATE NEED FOR ADDITIONAL STUDY," ACCORDING TO A PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES (PADER) OFFICIAL.

#SHEA
II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A BRIEF CHRONOLOGY OF SITE HISTORY AND ENFORCEMENT ACTIVITIES FOLLOWS:

1900 CIRCA:		AN OIL PIPELINE WAS CONSTRUCTED ACROSS THE SITE.
1934	:	WHITMOYER LABORATORIES, INC. (WLI) FORMED.
1957	:	WLI BEGINS PRODUCTION OF ORGANIC ARSENICALS.
1964	:	ROHM & HAAS BUYS WLI. CONCENTRATED WASTES PLACED IN A CONCRETE VAULT. GROUNDWATER PUMP-AND-TREAT PROGRAM INITIATED. OCEAN DUMPING OF WASTES BEGINS.
1971	:	GROUNDWATER PUMP-AND-TREAT AND OCEAN DUMPING PROGRAM TERMINATED.
1977	:	SLUDGES FROM GROUNDWATER TREATMENT CONSOLIDATED IN EASTERN LAGOONS.
1978	:	BEECHAM LABORATORIES ACQUIRES WLI.
1982	:	STAFFORD LABORATORIES, INC. PURCHASES WLI.
1984	:	STAFFORD LABORATORIES, INC. FILES FOR BANKRUPTCY. WHITMOYER LABORATORIES SITE PROPOSED FOR THE NATIONAL PRIORITY LIST (NPL).
1985	:	WLI FILES A RCRA CLOSURE PLAN WITH PADER, AND CHANGES ITS RCRA STATUS FROM A TREATMENT, STORAGE, OR DISPOSAL FACILITY TO A GENERATOR FACILITY.
1986	:	WHITMOYER LABORATORIES SITE FINALIZED ON THE NPL. EPA BEGINS PROVIDING BOTTLED WATER TO AREA RESIDENTS WITH CONTAMINATED WELLS.
1987	:	STAFFORD LABORATORIES, INC. ABANDONS FACILITY, WITH VERY LITTLE, IF ANY, OF THE RCRA CLOSURE PLAN IMPLEMENTED. EPA INITIATES THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS).
1988	:	EPA INITIATES AN EMERGENCY RESPONSE TO REMOVE ABANDONED DRUMS FROM THE SITE. THIS WORK CONTINUES INTO THE SUMMER OF 1990.
1989	:	EPA SELECTS A REMEDY FOR THE CONCENTRATED LIQUIDS OPERABLE UNIT. ABANDONED LABORATORY WASTES ARE PACKAGED AND DISPOSED BY EPA. THE WHITMOYER

LABORATORIES SITE RI REPORT IS FINALIZED. CLARENCE W. WHITMOYER, FORMER PRESIDENT OF WLI, DIES. US DEPARTMENT OF JUSTICE FILES CLAIM AGAINST ESTATE IN DADE COUNTY, FLORIDA.

1990 JANUARY : THE CONCENTRATED LIQUIDS (FIRST) OPERABLE UNIT REMEDIAL DESIGN IS COMPLETED.

1990 FEBRUARY : THE WHITMOYER LABORATORIES SITE FS REPORT, WHICH ADDRESSES THE MEDIA MAKING UP THE SECOND OPERABLE UNIT, AS WELL AS THE GROUNDWATER MEDIUM, IS FINALIZED. TWO FORMER SITE OWNERS, ROHM AND HAAS AND SMITHKLINE BEECHAM, PROPOSE TO EPA A SEPARATE REMEDIAL ALTERNATIVE FOR THE VAULT WASTES, LAGOON WASTES, MISCELLANEOUS PRODUCTS/FEEDSTOCKS, CONTAMINATED SOILS/SEDIMENTS, AND GROUNDWATER.

1990 MAY : THE CONCENTRATED LIQUIDS REMEDIAL ACTION COMMENCES.

1990 JUNE : THE FS REPORT WHICH ADDRESSES THE SOILS/SEDIMENT MEDIUM, IS FINALIZED. THE TWO FORMER SITE OWNERS, ROHM AND HAAS AND SMITHKLINE BEECHAM, PROPOSE TO EPA A SECOND, SEPARATE UNIQUE REMEDIAL ALTERNATIVE FOR THE VAULT WASTES, LAGOON WASTES, AND MISCELLANEOUS PRODUCTS/FEEDSTOCKS.

1990 SEPTEMBER : THE CONCENTRATED LIQUIDS REMEDIAL ACTION IS COMPLETED. TWO. THE TWO FORMER SITE OWNERS, ROHM AND HAAS AND SMITHKLINE BEECHAM, PROVIDE ADDITIONAL INFORMATION TO EPA ON THEIR SEPARATE REMEDIAL ALTERNATIVES, AND PROPOSE A SEPARATE REMEDIAL ALTERNATIVE FOR THE SITE STRUCTURES.

1990 SEPTEMBER: ROHM AND HAAS AND SMITHKLINE BEECHAM ENTER INTO CONSENT ORDER WITH EPA UNDER WHICH THEY WILL EXTEND PUBLIC WATER SERVICES TO RESIDENTS AFFECTED BY THE SITE.

1990 DECEMBER : EPA SELECTS A REMEDY FOR OU TWO.

#CRH
III. COMMUNITY RELATIONS HISTORY

IN ACCORDANCE WITH SECTIONS 113 AND 117 OF CERCLA, 42 USC SECTIONS 9613 AND 9617, EPA HELD A PUBLIC COMMENT PERIOD FROM JULY 16, 1990 THROUGH SEPTEMBER 14, 1990 FOR THE THIRD OPERABLE UNIT REMEDIAL ACTION DESCRIBED IN THE REMEDIAL INVESTIGATION (RI) AND FEASIBILITY STUDY (FS) REPORTS RELEASED IN APRIL 1990, AND THE SOILS FEASIBILITY STUDY REPORT AND PROPOSED PLAN RELEASED IN JULY 1990. THE NOTICE OF AVAILABILITY OF THESE DOCUMENTS WAS PUBLISHED IN THE HARRISBURG PATRIOT ON JULY 16, 1990 ALONG WITH NOTICE OF THE COMMENT PERIOD AND A PUBLIC HEARING TO BE HELD CONCERNING THE THIRD OPERABLE UNIT. THE RI AND FS REPORTS AND THE PROPOSED PLAN WERE MADE AVAILABLE TO THE PUBLIC IN THE ADMINISTRATIVE RECORD MAINTAINED IN THE EPA REGION III OFFICE AND AT THE MYERSTOWN PUBLIC LIBRARY. A PUBLIC MEETING WAS HELD ON AUGUST 1, 1990 TO OUTLINE THE PREFERRED REMEDIAL ACTION AND TO ACCEPT COMMENTS FROM THE ATTENDEES. A TRANSCRIPT OF THE PUBLIC MEETING WAS MAINTAINED IN ACCORDANCE WITH SECTION 117(A)(2) OF CERCLA, 42 USC SECTION 9617(A)(2). WRITTEN AND VERBAL COMMENTS WERE RECEIVED AND ARE ADDRESSED IN THE RESPONSIVENESS SUMMARY WHICH IS ATTACHED.

ALL DOCUMENTS THAT FORM THE BASIS FOR THE SELECTION OF THE REMEDIAL

DECISIONS CONTAINED IN THIS RECORD OF DECISION ARE INCLUDED IN THE ADMINISTRATIVE RECORD FOR THIS SITE AND CAN BE REVIEWED OR REFERRED TO FOR ADDITIONAL INFORMATION.

IV. SCOPE AND ROLE OF OPERABLE UNIT

AS WITH MANY SUPERFUND SITES, THE PROBLEMS AT THE WHITMOYER LABORATORIES SITE ARE COMPLEX. AS A RESULT, EPA IS ADDRESSING PORTIONS OF THE SITE CONTAMINATION USING ITS EMERGENCY RESPONSE AUTHORITIES, WHEREAS OTHER PORTIONS ARE BEING ADDRESSED AS A PART OF THE REMEDIAL PROGRAM.

A. EMERGENCY RESPONSE ACTIONS

THE APPROXIMATELY 800 DRUMS AND THE LABORATORY WASTES AND CHEMICALS AND PRODUCTION RUN SAMPLES ABANDONED AT THE SITE WERE DISPOSED AS AN EMERGENCY RESPONSE ACTION. A PUBLIC WATER SUPPLY LINE EXTENSION TO RESIDENCES WITH CONTAMINATED WELLS IS CURRENTLY BEING DESIGNED AND WILL BE CONSTRUCTED AS AN EMERGENCY RESPONSE ACTION. WHILE THE LINE IS BEING DESIGNED, AFFECTED RESIDENCES ARE BEING SUPPLIED BY EPA WITH BOTTLED WATER.

B. OTHER REMEDIAL ACTIONS

EPA HAS DIVIDED THE REMAINING REMEDIAL WORK INTO THREE OPERABLE UNITS (OUS). THESE ARE AS FOLLOWS:

* OU ONE: CONCENTRATED LIQUIDS ABANDONED IN TANKS AND PROCESS VESSELS

* OU TWO: VAULT WASTES, LAGOON WASTES, MISCELLANEOUS PRODUCTS/FEEDSTOCKS, AND SITE STRUCTURES

* OU THREE: CONTAMINATED SOILS/SEDIMENTS AND GROUNDWATER

EPA HAS ALREADY SELECTED THE CLEANUP REMEDY FOR OUS ONE AND TWO. THE CONCENTRATED LIQUIDS (OU ONE) POSE A PRINCIPAL THREAT AT THE SITE, BECAUSE OF THE POTENTIAL FOR DIRECT CONTACT; TANK/PIPING FAILURE WITH SUBSEQUENT CONTAMINATION OF TULPEHOCKEN CREEK; FIRE/EXPLOSION; AND TANK FAILURE FROM FLOODING. THIS ACTION IS IN THE REMEDIAL ACTION STAGE. THIS REMEDIATION WAS COMPLETED IN SEPTEMBER 1990.

THE CONCENTRATED WASTES ABANDONED IN A CONCRETE VAULT; CONCENTRATED WASTES ABANDONED IN TWO GROUPS OF LAGOONS; OUTDATED PRODUCTS AND MISCELLANEOUS CHEMICALS ABANDONED IN THE BUILDINGS; AND THE BUILDINGS AND RELATED STRUCTURES (TANKS, PROCESS VESSELS, ETC.) LOCATED ON THE SITE (OU TWO MATERIALS) ALSO POSE SOME OF THE PRINCIPAL THREATS TO HUMAN HEALTH AND THE ENVIRONMENT FROM THE SITE, BECAUSE OF THE FOLLOWING RISKS: POSSIBLE INGESTION OR DIRECT CONTACT WITH THE MATERIALS; CONTAMINANT MIGRATION FROM THE MATERIALS INTO THE UNDERLYING GROUNDWATER THAT IS A SOURCE OF DRINKING WATER FOR LOCAL RESIDENTS; AND CONTAMINANT MIGRATION TO SURFACE WATER. A RECORD OF DECISION FOR OU TWO WAS SIGNED BY THE EPA ON DECEMBER 17, 1990. MAJOR FEATURES OF THIS SELECTED REMEDY INCLUDE INCINERATION FOLLOWED BY FIXATION OF THE HIGH-ORGANIC-CONTENT (UPPER) VAULT WASTES, HAZARDOUS MISCELLANEOUS PRODUCTS/FEEDSTOCKS, AND HAZARDOUS, COMBUSTIBLE SITE STRUCTURES; FIXATION OF THE LOW-ORGANIC-CONTENT (LOWER) VAULT WASTES AND LAGOON WASTES; DIRECT LANDFILLING OF THE NONHAZARDOUS MISCELLANEOUS PRODUCTS/FEEDSTOCKS AND SITE STRUCTURES; SURFACE CLEANING OF HAZARDOUS, INCOMBUSTIBLE, IMPERMEABLE SITE STRUCTURES; AND COATING AND SEALING HAZARDOUS, INCOMBUSTIBLE, PERMEABLE SITE STRUCTURES. THE REMEDIAL DESIGN FOR OU TWO IS EXPECTED TO COMMENCE IN THE NEAR FUTURE.

THE THIRD OU ADDRESSED BY THIS ROD INCLUDES CONTAMINATED SOILS AND ADJACENT SEDIMENTS; AND GROUNDWATER. THESE MEDIA ALSO POSE SOME OF THE PRINCIPAL THREATS TO HUMAN HEALTH AND ENVIRONMENT FROM THE SITE. THE PURPOSES OF THIS RESPONSE FOR THE SOILS/SEDIMENTS ARE TO PREVENT CURRENT OR FUTURE EXPOSURE TO THE THESE MATERIALS THROUGH TREATMENT AND/OR CONTAINMENT, AND TO REDUCE THE MIGRATION OF CONTAMINANTS FROM THE

SOILS/SEDIMENTS TO GROUNDWATER AND SURFACE WATER. THE PURPOSES OF THIS RESPONSE FOR GROUNDWATER ARE TO CLEAN UP THE CONTAMINATED GROUNDWATER TO HEALTH-BASED CONCENTRATION LEVELS IF TECHNICALLY PRACTICABLE, AND TO PREVENT CURRENT OR FUTURE EXPOSURE TO GROUNDWATER EXCEEDING HEALTH-BASED CONCENTRATION LEVELS. THE REMEDY FOR THE THIRD OU IS CURRENTLY PROPOSED AS THE FINAL RESPONSE ACTION FOR THE SITE.

#OUC
V. OPERABLE UNIT CHARACTERISTICS

THE SITE MATERIALS TO BE REMEDIATED UNDER OU THREE ARE DESCRIBED AS FOLLOWS:

A. CONTAMINATED SOILS/SEDIMENTS

AS DISCUSSED IN THE WHITMOYER LABORATORIES SITE RI REPORT, NUMEROUS CHEMICALS AND HAZARDOUS SUBSTANCES WERE DETECTED IN THE CONTAMINATED SOILS/SEDIMENTS IN AND AROUND THE PLANT SITE. IN THE BASELINE RISK ASSESSMENT FOR THE SOILS/SEDIMENTS, ARSENIC CONTAMINATION WAS DETERMINED TO PRESENT THE GREATEST RISK FOR THE EXPOSURE SCENARIOS STUDIED. OTHER PRIMARY SOIL CONTAMINANTS IDENTIFIED INCLUDE ANILINE, N-NITROSODIPHENYLAMINE, TETRACHLOROETHENE (PCE), TRICHLOROETHENE (TCE), TOTAL-1,2-DICHLOROETHENE, BENZENE, PYRENE, BENZO(A)PYRENE, BENZO(B)FLUORANTHENE, AND INDENO(1,2,3-CD)-PYRENE. ALL OF THESE CONTAMINANTS ARE KNOWN OR PROBABLE CARCINOGENS. ARSENIC, PCE, AND TOTAL-1,2-DICHLOROETHENE ARE ALSO CONSIDERED TO BE SYSTEMIC TOXICANTS.

CONTAMINATED SURFACE SOILS AT THE WHITMOYER LABORATORIES SITE POSE AN ACTUAL OR POTENTIAL THREAT OF INHALATION/INGESTION EXPOSURE IF NO REMEDIATION OCCURS. EPA HAS DETERMINED THAT CLEANING UP THE CONTAMINATED SURFACE SOIL TO A CONCENTRATION OF 21 MG/KG OF ARSENIC WILL REDUCE THE EXCESS LIFETIME CANCER RISK POSED BY THE SURFACE SOILS FOLLOWING REMEDIATION UNDER THE RESIDENTIAL USE (SOIL INGESTION/INHALATION) SCENARIO TO 1 X (10-6). THIS 21 MG/KG CLEANUP TARGET WAS ESTABLISHED FOR THIS SITE AS PART OF THE RISK ASSESSMENT CONDUCTED DURING THE RI/FS.

SURFACE AND SUBSURFACE SOILS ALSO POSE A THREAT TO GROUNDWATER. THE THREAT DIFFERS DEPENDING ON WHETHER THE SOILS ARE ABOVE OR BELOW THE GROUNDWATER TABLE ("UNSATURATED" OR "SATURATED", RESPECTIVELY). EPA HAS DETERMINED THAT THE SOILS SHOULD BE REMEDIATED TO ENSURE THAT MIGRATION OF SOIL CONTAMINANTS TO GROUNDWATER WOULD NOT CAUSE GROUNDWATER CONTAMINANT CONCENTRATIONS TO EXCEED THE GROUNDWATER CLEANUP TARGETS CITED BELOW. GROUNDWATER-BASED CLEANUP TARGETS FOR SATURATED AND UNSATURATED SOILS ARE PROVIDED IN TABLE 1.

FOR THE WHITMOYER LABORATORIES SITE, EPA HAS DETERMINED THAT SOILS/SEDIMENTS WHICH CONTAIN AT LEAST ONE CONTAMINANT WHOSE LEACHATE CONCENTRATIONS WOULD LIKELY EXCEED 100 TIMES THE GROUNDWATER CLEANUP TARGETS ARE THE PRINCIPAL THREATS FROM THE SOIL/SEDIMENT MEDIUM. THE CORRESPONDING SOIL CONCENTRATIONS ARE PROVIDED IN TABLE 1. NEARLY ALL OF THE "PRINCIPAL THREAT" (HEAVILY CONTAMINATED) SOILS/SEDIMENTS CONTAIN ARSENIC IN CONCENTRATIONS GREATER THAN 1000 MG/KG, THE ARSENIC ACTION LEVEL FOR TREATMENT. SOILS WITH ARSENIC CONCENTRATIONS GREATER THAN THIS LEVEL WILL LIKELY EXHIBIT THE RCRA CHARACTERISTIC OF ARSENIC TOXICITY BASED ON A STATISTICAL CORRELATION BETWEEN TOTAL ARSENIC CONCENTRATIONS IN SOIL AND ARSENIC CONCENTRATIONS IN THE RESULTING LEACHATE. THIS CORRELATION WAS DEVELOPED BY EPA USING THE STANDARD TCLP TESTING PROCEDURES AND IS FULLY DESCRIBED IN THE FEASIBILTIY STUDY REPORT FOR THIS SITE.

FOR THIS ROD, CONTAMINATED SOILS/SEDIMENTS ARE DEFINED AS THE CONTAMINATED SOILS AND ADJACENT SEDIMENTS THAT ARE CONTAMINATED WITH ARSENIC AND/OR ORGANIC CHEMICALS ABOVE REMEDIAL ACTION LEVELS. THE BASELINE RISK ASSESSMENT INDICATED THAT CONTAMINATED SEDIMENTS ALONE DO NOT APPEAR TO CONSTITUTE A SIGNIFICANT RISK TO HUMAN HEALTH AND THE ENVIRONMENT. AS A RESULT, THE ONLY SEDIMENTS ADDRESSED BY THIS ROD ARE

THOSE SEDIMENTS BOUNDED BY SOILS CONTAMINATED ABOVE THE REMEDIAL ACTION LEVELS.

THE RI SURFACE SOIL DATA INDICATING ARSENIC AND ORGANIC CHEMICAL CONTAMINATION ARE PRESENTED ON FIGS. 3 AND 4, RESPECTIVELY. THESE DATA DEMONSTRATE WIDESPREAD ONSITE AND OFFSITE ARSENIC CONTAMINATION. SURFACE ORGANIC CHEMICAL CONTAMINATION APPEARS TO BE LIMITED TO ONSITE SOILS. THE RI SUBSURFACE SOIL DATA INDICATING ARSENIC AND ORGANIC CHEMICAL CONTAMINATION IN THE 2-FOOT TO 6-FOOT DEPTH INTERVAL ARE PRESENTED ON FIGS. 5 AND 6, RESPECTIVELY. ON FIGS. 7 AND 8, THE RI SUBSURFACE SOIL DATA INDICATING ARSENIC AND ORGANIC CHEMICAL CONTAMINATION AT DEPTHS GREATER THAN 6 FEET ARE PRESENTED, RESPECTIVELY. THE SUBSURFACE SOIL DATA INDICATE THAT ARSENIC AND ORGANIC CHEMICAL CONTAMINATION ARE PRESENT IN SUBSURFACE SOILS ONSITE. ARSENIC CONTAMINATION IS RELATIVELY WIDESPREAD IN OFFSITE SUBSURFACE SOILS, WHEREAS ONLY A LIMITED DEGREE OF SUBSURFACE SOIL ORGANIC CHEMICAL CONTAMINATION IN OFFSITE AREAS WAS NOTED DURING THE RI.

THE ESTIMATED VOLUMES OF SOILS/SEDIMENTS HAVING AT LEAST ONE CONTAMINANT WHOSE CONCENTRATION EXCEEDS THE REMEDIAL ACTION LEVELS ARE PROVIDED IN TABLE 2 FOR EACH EXPOSURE SCENARIO DESCRIBED ABOVE. AN ESTIMATED 480,000 CY OF SOILS/SEDIMENTS PRESENT AT THE SITE HAVE ARSENIC CONCENTRATIONS IN EXCESS OF THE BACKGROUND (1 X (10-6) EXCESS LIFETIME CANCER RISK) CONCENTRATION OF 21 MG/KG. THESE SOILS ARE LOCATED ON AN ESTIMATED 46 ACRES. APPROXIMATELY 61,000 CY OF SOILS/SEDIMENTS CONTAIN AT LEAST ONE CONTAMINANT WHOSE CONCENTRATION IS GREATER THAN THE PRINCIPAL THREAT ACTION LEVELS. OF THIS AMOUNT, ABOUT 5,600 CY OF THE PRINCIPAL THREAT SOILS CONTAIN CONTAMINANTS EXCEEDING THE ORGANIC-BASED PRINCIPAL THREAT ACTION LEVELS.

B. GROUNDWATER

DURING THE RI, NUMEROUS CONTAMINANTS WERE ALSO DETECTED IN THE GROUNDWATER IN AND AROUND THE PLANT SITE. IN THE BASELINE RISK ASSESSMENT FOR GROUNDWATER, ARSENIC CONTAMINATION WAS DETERMINED TO PRESENT THE GREATEST RISK FOR THE EXPOSURE SCENARIOS STUDIED. OTHER PRIMARY GROUNDWATER CONTAMINANTS IDENTIFIED INCLUDE ANTIMONY, CADMIUM, MANGANESE, ANILINE, 4-CHLOROANILINE, PCE, TCE, TOTAL-1,2-DICHLOROETHENE, 1,1-DICHLOROETHENE, METHYLENE CHLORIDE, AND BENZENE. ARSENIC, ANILINE, PCE, TCE, 1,1-DICHLOROETHENE, METHYLENE CHLORIDE, AND BENZENE ARE CLASSIFIED AS KNOWN OR PROBABLE CARCINOGENS. ARSENIC, ANTIMONY, CADMIUM, MANGANESE, 4-CHLOROANILINE, PCE, TOTAL-1,2-DICHLOROETHENE, AND 1,1-DICHLOROETHENE ARE CLASSIFIED AS SYSTEMIC TOXICANTS.

CONTAMINATED GROUNDWATER AT THE WHITMOYER LABORATORIES SITE POSES AN ACTUAL OR POTENTIAL THREAT TO HUMAN HEALTH AND THE ENVIRONMENT IF NO REMEDIATION OCCURS. EPA HAS DETERMINED THAT CONTAMINANT CONCENTRATIONS IN GROUNDWATER AT THE WHITMOYER LABORATORIES SITE SHOULD BE CLEANED TO FEDERAL AND STATE DRINKING WATER STANDARDS, WHERE THEY ARE AVAILABLE FOR THE PARTICULAR CONTAMINANTS. THESE HEALTH-BASED STANDARDS REDUCE THE RISKS POSED BY THE CONTAMINANTS TO ACCEPTABLE LEVELS. WHEN THERE ARE NO FEDERAL OR STATE DRINKING WATER STANDARDS, EPA HAS DETERMINED THAT THE EXCESS LIFETIME CANCER RISK POSED BY EACH CONTAMINANT FOLLOWING REMEDIATION SHOULD BE REDUCED TO 1 X (10-6). THIS CANCER RISK LEVEL WOULD REDUCE THE PROBABILITY OF CONTRACTING CANCER AS A RESULT OF DIRECT EXPOSURE TO THESE CONTAMINANTS IN THE GROUNDWATER TO ONE ADDITIONAL PERSON IN ONE MILLION, WHICH IS AN ACCEPTABLE LEVEL. THESE CLEANUP TARGETS WERE ESTABLISHED FOR THIS SITE AS PART OF THE RISK ASSESSMENT CONDUCTED DURING THE RI/FS. USING THIS APPROACH, EPA DETERMINED THAT CLEANING UP CONTAMINATED GROUNDWATER TO THE CONCENTRATIONS OF 50 UG/L ARSENIC AND 10 UG/L ANILINE WILL BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. ALL GROUNDWATER CONTAINING OTHER CONTAMINANT CONCENTRATIONS ABOVE RISK-BASED LEVELS HAVE ARSENIC AND/OR ANILINE CONCENTRATIONS ABOVE THE LEVELS CITED ABOVE (I.E., THE EXTENT OF CONTAMINATED GROUNDWATER IS ADEQUATELY DEFINED BY THE ANILINE AND ARSENIC CRITERIA).

THE ESTIMATED AREAL EXTENT OF CONTAMINATED GROUNDWATER USING THE ARSENIC

AND ANILINE CRITERIA IS PRESENTED ON FIGURE 9 AND TOTALS 215 ACRES. THE DEPTH OF CONTAMINATION WAS NOT COMPLETELY DEFINED DURING THE RI; AN ASSUMED DEPTH OF 500 FEET FROM GROUND SURFACE WAS USED DURING THE RI/FS. THIS ASSUMPTION RESULTS IN AN ESTIMATED VOLUME OF CONTAMINATED GROUNDWATER OF 350,000,000 GALLONS. THE ESTIMATED AVERAGE ARSENIC, ANILINE AND PCE CONCENTRATIONS IN THIS GROUNDWATER ARE 17 MG/L, 6.4 MG/L, AND 0.25 MG/L RESPECTIVELY. THE ESTIMATED DISSOLVED QUANTITIES OF THESE CONTAMINANTS ARE 44,000 LBS, 20,000 LBS, AND 730 LBS, RESPECTIVELY. THESE QUANTITIES REFLECT ONLY THE DISSOLVED PORTION OF THE CONTAMINANTS IN THE GROUNDWATER. SUBSTANTIAL AMOUNTS OF THE GROUNDWATER CONTAMINANTS MAY ALSO BE ADSORBED ONTO CLAYS FOUND WITHIN THE BEDROCK FRACTURES, AND ORGANIC CHEMICALS SUCH AS PCE AND ANILINE COULD ALSO BE PRESENT IN THE BEDROCK AS NONAQUEOUS PHASE LIQUIDS.

#SSR

VI. SUMMARY OF SITE RISKS

THE OBJECTIVE OF THIS SECTION IS TO ESTIMATE THE POTENTIAL FOR ADVERSE HEALTH OR ENVIRONMENTAL EFFECTS INCURRED BY HUMAN OR ECOLOGICAL RECEPTORS EXPOSED TO THE MATERIALS MAKING UP THE OU THREE UNDER THE EXPOSURE SCENARIOS ESTABLISHED IN THE RI REPORT FOR THE WHITMOYER LABORATORIES SITE. THIS SECTION CHARACTERIZES THE POTENTIAL NONCARCINOGENIC, CARCINOGENIC, AND ENVIRONMENTAL RISKS ASSOCIATED WITH OU THREE. EPA GUIDELINES FOR THE USE OF DOSE-ADDITIVE MODELS ARE USED TO COMBINE THE RISKS FOR INDIVIDUAL CHEMICALS TO ESTIMATE CUMULATIVE RISKS FOR THE MIXTURES FOUND ONSITE, ASSUMING THE TOXICOLOGICAL ENDPOINTS ARE THE SAME. THIS SECTION SUMMARIZES THE RISK ASSESSMENT PRESENTED IN THE WHITMOYER LABORATORIES SITE RI REPORT, WHICH WAS FINALIZED IN NOVEMBER 1989.

A. HUMAN HEALTH RISKS

FOR HUMAN HEALTH RISKS, BOTH CARCINOGENIC RISK AND THE POTENTIAL FOR NONCARCINOGENIC EFFECTS ARE PRESENTED. CARCINOGENIC RISK IS EVALUATED BY DETERMINING THE EXCESS LIFETIME CANCER RISKS (ELCRS) FOR ACTUAL OR POTENTIALLY EXPOSED INDIVIDUALS. ELCRS ARE DETERMINED BY MULTIPLYING THE CONTAMINANT EXPOSURE DOSE WITH THE CANCER POTENCY FACTOR (CANCER SLOPE FACTOR). THESE RISKS ARE PROBABILITIES THAT ARE GENERALLY EXPRESSED IN SCIENTIFIC NOTATION (E.G., 1 X 10-6). AN ELCR OF 1 X (10-6) INDICATES THAT, AS A PLAUSIBLE UPPER BOUND, AN INDIVIDUAL HAS A ONE-IN-ONE MILLION CHANCE OF DEVELOPING CANCER AS A RESULT OF SITE-RELATED EXPOSURE TO A CARCINOGEN OVER A 70-YEAR LIFETIME UNDER THE SPECIFIC EXPOSURE CONDITIONS AT A SITE.

CANCER POTENCY FACTORS (CPFS) HAVE BEEN DEVELOPED BY EPA'S CARCINOGEN RISK ASSESSMENT VERIFICATION ENDEAVOR WORKGROUP FOR ESTIMATING LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC CHEMICALS. CPFS, WHICH ARE EXPRESSED IN UNITS OF (MG/KG-DAY)-1, ARE MULTIPLIED BY THE ESTIMATED INTAKE OF A POTENTIAL CARCINOGEN, IN MG/KG-DAY, TO PROVIDE AN UPPER BOUND ESTIMATE OF THE ELCR ASSOCIATED WITH EXPOSURE AT THAT INTAKE LEVEL. THE TERM "UPPER BOUND" REFLECTS THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE CPF. USE OF THIS APPROACH MAKES UNDERESTIMATION OF THE ACTUAL CANCER RISK HIGHLY UNLIKELY. CANCER POTENCY FACTORS ARE DERIVED FROM THE RESULTS OF HUMAN EPIDEMIOLOGICAL STUDIES OR CHRONIC ANIMAL BIOASSAYS TO WHICH ANIMAL-TO-HUMAN EXTRAPOLATION AND UNCERTAINTY FACTORS HAVE BEEN APPLIED.

POTENTIAL CONCERN FOR NONCARCINOGENIC EFFECTS OF A SINGLE CONTAMINANT IN A SINGLE MEDIUM IS EXPRESSED AS THE HAZARD QUOTIENT (HQ) (OR THE RATIO OF ESTIMATED INTAKE DERIVED FROM THE CONTAMINANT CONCENTRATION IN A GIVEN MEDIUM TO THE CONTAMINANT'S REFERENCE DOSE (RFD)). THE HQ IS ALSO REFERRED TO AS THE DOSE/RFD RATIO. BY ADDING THE HQS FOR ALL CONTAMINANTS WITHIN A MEDIUM OR ACROSS ALL MEDIA TO WHICH A GIVEN POPULATION MAY REASONABLY BE EXPOSED, THE HAZARD INDEX (HI) CAN BE GENERATED. THE HI PROVIDES A USEFUL REFERENCE POINT FOR GAUGING THE POTENTIAL SIGNIFICANCE OF MULTIPLE CONTAMINANT EXPOSURES WITHIN A SINGLE

MEDIUM OR ACROSS MEDIA.

REFERENCE DOSES (RFDS) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM EXPOSURE TO CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS. RFDS, WHICH ARE EXPRESSED IN UNITS OF MG/KG-DAY, ARE ESTIMATES OF ACCEPTABLE LIFETIME DAILY EXPOSURE LEVELS FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS. ESTIMATED INTAKES OF CHEMICALS FROM ENVIRONMENTAL MEDIA (E.G., THE AMOUNT OF A CHEMICAL INGESTED FROM CONTAMINATED DRINKING WATER) CAN BE COMPARED TO THE RFD. RFDS ARE DERIVED FROM HUMAN EPIDEMIOLOGICAL STUDIES OR ANIMAL STUDIES TO WHICH UNCERTAINTY FACTORS HAVE BEEN APPLIED (E.G., TO ACCOUNT FOR THE USE OF ANIMAL DATA TO PREDICT EFFECTS IN HUMANS). THESE UNCERTAINTY FACTORS HELP ENSURE THAT THE RFDS WILL NOT UNDERESTIMATE THE POTENTIAL FOR ADVERSE NONCARCINOGENIC HEALTH EFFECTS TO OCCUR.

THE FOLLOWING RISK SUMMARY IS PRESENTED BY MEDIUM FOR THE OU THREE MEDIA.

1. SOILS/SEDIMENTS

THE CONTAMINANT CONCENTRATIONS AND EXPOSURE PATHWAYS FOR THE CONTAMINATED SOILS SEDIMENTS ARE BRIEFLY DESCRIBED ABOVE IN SECTION V.A. ABOVE. THE MAJOR EXPOSURE PATHWAYS INCLUDE ACCIDENTAL INGESTION/INHALATION BY FUTURE SITE RESIDENTS, PRESENT OR FUTURE SITE WORKERS, OR FARMERS CULTIVATING OR PASTURING ANIMALS ON FIELDS ADJACENT TO THE SITE PRESENTLY OR IN THE FUTURE; CONSUMPTION OF CROPS/BEEF GROWN ON/PASTURED ON FIELDS ADJACENT TO THE SITE PRESENTLY OR IN THE FUTURE; AND PRESENT OR FUTURE CONSUMPTION OF GROUNDWATER CONTAMINATED BY SOIL/SEDIMENT LEACHATE.

A CONSERVATIVE ACCIDENTAL INGESTION/INHALATION EXPOSURE SCENARIO FOR RESIDENTIAL USE OF THE SITE WAS DEVELOPED. KEY ASSUMPTIONS INCLUDE THAT CHILDREN AND ADULTS WOULD INGEST 200 MG/DAY AND 100 MG/DAY OF SOIL, RESPECTIVELY. BASED ON THIS SCENARIO, AN HQ OF 470 AND AN ELCR OF 1.1 X (10-1) WAS CALCULATED FOR A REASONABLE WORST-CASE EXPOSURE TO THE ARSENIC IN SOILS FROM THE DRUM BURIAL AREA OF THE SITE. THUS, UNDER THE CONDITIONS OF THE RISK ASSESSMENT, ADVERSE NONCARCINOGENIC HEALTH EFFECTS ARE POSSIBLE (SINCE THE HQ IS GREATER THAN 1), AND THE CARCINOGENIC RISK IS GREATER THAN THE CERCLA ACCEPTABLE ELCR OF BETWEEN 1 X (10-4) AND 1 X (10-6).

SIMILARLY, A CONSERVATIVE ACCIDENTAL INGESTION/INHALATION EXPOSURE SCENARIO WAS DEVELOPED FOR COMMERCIAL/INDUSTRIAL USE OF THE SITE. KEY ASSUMPTIONS OF THIS SCENARIO INCLUDE THAT ADULTS WOULD INGEST 100 MG/DAY OF SOIL FOR 165 DAYS/YEAR AND A 40-YEAR WORKING LIFETIME. BASED ON THIS SCENARIO, AN HQ OF 18.2 AND AN ELCR OF 1.87 X (10-2) WAS CALCULATED FOR A REASONABLE WORST-CASE EXPOSURE TO SOILS FROM THE DRUM BURIAL AREA OF THE SITE. THUS, ADVERSE NONCARCINOGENIC HEALTH EFFECTS ARE POSSIBLE AND THERE IS A SIGNIFICANT EXCESS LIFETIME CANCER RISK UNDER THE CONDITIONS OF THE RISK ASSESSMENT.

FARM WORKERS TILLING FIELDS CONTAINING CONTAMINATED SURFACE SOILS ADJACENT TO THE SITE CAN POTENTIALLY INHALE SOIL PARTICULATES. A CONSERVATIVE INHALATION MODEL FOR THIS EXPOSURE WAS DEVELOPED IN THE BASELINE RISK ASSESSMENT. KEY ASSUMPTIONS OF THIS MODEL INCLUDE THAT THE WORKERS WOULD INHALE 1.3 CUBIC METERS PER HOUR OF PARTICULATE-LADEN AIR FOR 12 HOURS/DAY AND 10 DAYS/YEAR OF A 40-YEAR WORKING LIFETIME. BASED ON THIS SCENARIO, AN ELCR OF 3.0 X (10-2) WAS CALCULATED FOR AN EXPOSURE TO AVERAGE SOIL ARSENIC CONCENTRATIONS IN SOILS FROM THE GRUMBINE FIELD IMMEDIATELY NORTH OF THE WHITMOYER LABORATORIES PROPERTY. THUS, THERE IS A SIGNIFICANT EXCESS LIFETIME CANCER RISK UNDER THE CONDITIONS OF THE RISK ASSESSMENT.

CONSUMPTION OF VEGETABLES GROWN ON CONTAMINATED SOILS AND CONSUMPTION OF BEEF OR DAIRY PRODUCTS RAISED ON/PRODUCED ON CONTAMINATED PASTURELAND ALSO POSE POTENTIAL RISK TO HUMAN HEALTH. THESE EXPOSURES WERE ALSO MODELED IN THE BASELINE RISK ASSESSMENT. KEY ASSUMPTIONS FOR THE VEGETABLE CONSUMPTION SCENARIO INCLUDE A SOIL-VEGETABLE PARTITION

COEFFICIENT (CONTAMINANT CONCENTRATION IN PLANT/CONTAMINANT CONCENTRATION IN SOIL) OF 0.2, A 50 GRAM/DAY CONSUMPTION RATE, AND A 70 KILOGRAM (KG) RECEPTOR BODY WEIGHT. KEY ASSUMPTIONS FOR THE SCENARIO INVOLVING CONSUMPTION OF BEEF OR DAIRY PRODUCTS PRODUCED FROM ANIMALS PASTURED ON CONTAMINATED FIELDS INCLUDE A SOIL-VEGETATION PARTITION COEFFICIENT OF 0.2, A PRODUCT-VEGETATION PARTITION COEFFICIENT (CONTAMINANT CONCENTRATION IN MILK OR BEEF/CONTAMINANT CONCENTRATION IN SOIL) OF 0.01 FOR BEEF AND 0.001 FOR DAIRY PRODUCTS, AND A 70 KG RECEPTOR BODY WEIGHT. BASED ON THESE SCENARIOS, AN HQ OF 13.8 AND AN ELCR OF 2.1 X (10-2) WAS CALCULATED FOR VEGETABLE CONSUMPTION; AN ELCR OF 1.9 X (10-4) WAS CALCULATED FOR BEEF CONSUMPTION; AND AN ELCR OF 7 X (10-5) WAS CALCULATED FOR MILK CONSUMPTION FOR PRODUCTS PRODUCED ON SOILS FROM THE GRUMBINE FIELD HAVING AVERAGE SOIL ARSENIC CONCENTRATIONS. THUS, ADVERSE NONCARCINOGENIC HEALTH EFFECTS ARE POSSIBLE AND THERE IS A SIGNIFICANT EXCESS LIFETIME CANCER RISK UNDER THE CONDITIONS OF THE RISK ASSESSMENT.

PRECIPITATION THAT HAS CONTACTED CONTAMINATED SOILS COULD RUN OFF AND POTENTIALLY CONTAMINATE SURFACE WATER. THE SURFACE-WATER PATHWAY WAS NOT QUANTITATIVELY ANALYZED IN THE BASELINE RISK ASSESSMENT.

CONTAMINATED SOILS ARE CONTRIBUTING TO THE GROUNDWATER CONTAMINATION AT THE WHITMOYER LABORATORIES SITE AND WOULD CONTINUE TO CONTAMINATE GROUNDWATER IN THE FUTURE IF LEFT UNREMEDIATED. THE GROUNDWATER PATHWAY IS FURTHER DISCUSSED BELOW.

2. GROUNDWATER

AS IDENTIFIED IN THE RI AND DESCRIBED BRIEFLY IN SECTION V.B, THE GROUNDWATER AT THE SITE AND DOWNGRADIENT OF THE SITE IS HIGHLY CONTAMINATED. PEAK CONCENTRATIONS OF ARSENIC AND ORGANICS (E.G., TETRACHLOROETHENE) MEASURED IN THE GROUNDWATER EXCEED SAFE DRINKING WATER ACT (SDWA) MAXIMUM CONTAMINANT LEVELS (MCLS) OF 50 UG/L ARSENIC AND 5 UG/L TETRACHLOROETHENE (PROPOSED) BY A FACTOR OF ABOUT 3,000. ELCRS AND HIS FOR THE ONSITE/NEAR-SITE GROUNDWATER (RESIDENTIAL USE-REASONABLE WORST CASE SCENARIO) APPROACH UNITY AND EXCEED 6000, RESPECTIVELY. THIS SCENARIO ASSUMES RESIDENTIAL USE OF THE SITE AND CONSUMPTION OF THE MOST CONTAMINATED GROUNDWATER AT A RATE OF 2 LITERS/DAY FOR 70 YEARS BY A 70-KG ADULT. THE RISK DATA INDICATE POTENTIAL ADVERSE CARCINOGENIC AND NONCARCINOGENIC EFFECTS UNDER THIS EXPOSURE SCENARIO.

B. ENVIRONMENTAL RISKS

BASED ON THE AQUATIC BIOTA SURVEY AND FISH TISSUE SAMPLING CONDUCTED DURING THE RI, NO EVIDENCE OF IMPACTS ON THE ECOSYSTEM FROM THE SITE WAS OBSERVED. FISH TISSUE ARSENIC CONCENTRATIONS WERE BELOW 2 MG/KG, THE METHOD DETECTION LIMIT. SENSITIVE BENTHIC SPECIES, E.G., STONEFLIES AND MAYFLIES, WERE FOUND IN DOWNSTREAM WATERS OF TULPEHOCKEN CREEK. (THERE ARE NO ENDANGERED SPECIES OR NATURAL RESOURCES OF SPECIAL CONCERN IN THE VICINITY OF THE SITE.) THUS, CONTAMINATION FROM THE MATERIALS MAKING UP OU THREE DO NOT APPEAR TO BE IMPACTING THE ECOSYSTEM CURRENTLY. AS HEAVILY CONTAMINATED GROUNDWATER CONTINUES TO MIGRATE OFFSITE OVER TIME, CONTAMINANT CONTRIBUTION TO SURFACE WATER AND SEDIMENT COULD POTENTIALLY AFFECT THE ECOSYSTEM IN THE FUTURE IF NO REMEDIATION OCCURS.

IN SUMMARY, ACTUAL OR THREATENED RELEASES OF HAZARDOUS SUBSTANCES FROM THE MATERIALS MAKING UP OU THREE, IF NOT ADDRESSED BY IMPLEMENTING THE RESPONSE IN THIS ROD, MAY PRESENT AN IMMINENT AND SUBSTANTIAL ENDANGERMENT TO PUBLIC HEALTH, WELFARE, OR THE ENVIRONMENT.

#DCA
VII. DESCRIPTION AND COMPARISON OF ALTERNATIVES

BASED ON THE RI RISK ASSESSMENT FOR THE OU THREE MATERIALS, EPA DEVELOPED THE FOLLOWING REMEDIAL ACTION OBJECTIVES TO PROTECT HUMAN

HEALTH AND THE ENVIRONMENT:

1. PREVENT HUMAN EXPOSURE (DERMAL CONTACT, INGESTION, INHALATION) TO SOILS/SEDIMENTS HAVING CONTAMINANTS IN CONCENTRATIONS GREATER THAN CARCINOGENIC (ELCR GREATER THAN 1 X (10-6) AND NONCARCINOGENIC (HAZARD INDEX GREATER THAN 1) RISK-BASED LEVELS.

2. PREVENT HUMAN EXPOSURE (DERMAL CONTACT, INGESTION, INHALATION) TO GROUNDWATER HAVING CONTAMINANTS IN CONCENTRATIONS GREATER THAN MCLS (E.G., 50 UG/L ARSENIC AND 5 UG/L PCE), WHERE AVAILABLE, OR, IF MCLS ARE NOT AVAILABLE, CARCINOGENIC (ELCR GREATER THAN 1 X (10-6) AND NONCARCINOGENIC (HAZARD INDEX GREATER THAN 1) RISK-BASED LEVELS.

3.PREVENT MIGRATION (VIA LEACHING) OF CONTAMINANTS IN SOILS/SEDIMENTS THAT WOULD RESULT IN GROUNDWATER CONTAMINATION IN EXCESS OF MCLS (E.G., 50 UG/L ARSENIC AND 5 UG/L PCE), WHERE AVAILABLE, OR CARCINOGENIC/NONCARCINOGENIC RISK-BASED CLEANUP LEVELS (ELCR GREATER THAN 1 X (10-6) HAZARD INDEX GREATER THAN 1).

4. PREVENT MIGRATION OF CONTAMINANTS IN SOILS/SEDIMENTS (VIA RUNOFF, FLOODING, EROSION) OR GROUNDWATER (VIA GROUNDWATER DISCHARGE) THAT WOULD RESULT IN SURFACE-WATER CONTAMINATION IN EXCESS OF THE MORE STRINGENT OF THE PENNSYLVANIA WATER QUALITY STANDARDS (E.G., 50 UG/L ARSENIC) OR FEDERAL AMBIENT WATER QUALITY CRITERIA, WHERE AVAILABLE; OR CARCINOGENIC/NONCARCINOGENIC RISK-BASED CLEANUP LEVELS.

5. RESTORE GROUNDWATER CONTAMINANT CONCENTRATIONS TO THE MCLS (E.G., 50 UG/L ARSENIC), WHERE AVAILABLE, OR CARCINOGENIC/NONCARCINOGENIC RISK-BASED CLEANUP LEVELS (ELCR GREATER THAN 1 X (10-6) HAZARD INDEX GREATER THAN 1) AS SOON AS IS TECHNICALLY PRACTICABLE.

6. COMPLY WITH CHEMICAL-SPECIFIC, LOCATION-SPECIFIC, AND ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REGULATIONS (ARARS), INCLUDING MCLS AND RCRA LAND DISPOSAL RESTRICTIONS.

BASED ON DATA AVAILABLE IN THE RI AND FS REPORTS, THE FOLLOWING OU THREE MATERIALS WILL NEED TO BE REMEDIATED TO ACHIEVE THE REMEDIAL ACTION OBJECTIVES:

* CONTAMINATED SOILS/SEDIMENTS - ESTIMATED VOLUME IS 480,000 CUBIC YARDS.
* CONTAMINATED GROUNDWATER - ESTIMATED VOLUME IS 350,000,000 GALLONS

THE SUPERFUND PROCESS REQUIRES THAT THE ALTERNATIVE CHOSEN TO CLEAN UP A HAZARDOUS WASTE SITE MEET SEVERAL CRITERIA. THE ALTERNATIVE MUST PROTECT HUMAN HEALTH AND THE ENVIRONMENT, BE COST-EFFECTIVE, AND MEET THE REQUIREMENTS OF ENVIRONMENTAL REGULATIONS. PERMANENT SOLUTIONS TO CONTAMINATION PROBLEMS SHOULD BE DEVELOPED WHEREVER POSSIBLE. THESE SOLUTIONS SHOULD REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF THE CONTAMINANTS. EMPHASIS IS ALSO PLACED ON TREATING THE WASTES AT THE SITE, WHENEVER THIS IS POSSIBLE, AND ON APPLYING INNOVATIVE TECHNOLOGIES TO CLEAN UP THE CONTAMINANTS.

EPA STUDIED A VARIETY OF TECHNOLOGIES TO SEE IF THEY WERE APPLICABLE FOR USE ON THE CONTAMINATED SOILS/SEDIMENTS AND GROUNDWATER. THE TECHNOLOGIES DETERMINED TO BE MOST APPLICABLE TO THESE MATERIALS WERE DEVELOPED INTO REMEDIAL ALTERNATIVES. BECAUSE OF THE DIFFERENT NATURE OF EACH OF THESE MEDIA, SEPARATE REMEDIAL ALTERNATIVES FOR EACH MEDIUM WERE DEVELOPED. THESE INDIVIDUAL ALTERNATIVES ARE PRESENTED AND DISCUSSED BELOW. THE REMEDIAL ALTERNATIVES DEVELOPED BY THE FORMER SITE OWNERS AND PRESENTED TO THE EPA ARE ALSO DESCRIBED AND DISCUSSED.

A. SUMMARY OF ALTERNATIVES - SOILS/SEDIMENTS

ALTERNATIVES 1 THROUGH 8 FOR THE CONTAMINATED SOILS/SEDIMENTS ARE NUMBERED TO CORRESPOND WITH THE NUMBERS IN THE SOILS FS REPORT (7/90).

ALTERNATIVE 9 IS THE ALTERNATIVE PRESENTED BY THE FORMER SITE OWNERS. THE ALTERNATIVES ARE THE FOLLOWING:

* ALTERNATIVE 1: NO ACTION
* ALTERNATIVE 2: SOIL CAPPING
* ALTERNATIVE 3: CONSOLIDATION/CLAY CAPPING
* ALTERNATIVE 4: BULK EXCAVATION/OFFSITE LANDFILL
* ALTERNATIVE 5: BULK EXCAVATION/FIXATION/OFFSITE LANDFILL
* ALTERNATIVE 6: BULK EXCAVATION/BIOLOGICAL TREATMENT, FIXATION/OFFSITE LANDFILL
* ALTERNATIVE 7: BULK EXCAVATION/INCINERATION, FIXATION/OFFSITE LANDFILL
* ALTERNATIVE 8: IN-SITU VITRIFICATION
* ALTERNATIVE 9: SOIL FLUSHING

1. ALTERNATIVE 1: NO ACTION

THE SUPERFUND PROGRAM REQUIRES THAT THE "NO ACTION" ALTERNATIVE BE EVALUATED AT EVERY SITE TO ESTABLISH A BASELINE FOR COMPARISON WITH THE OTHER ALTERNATIVES. UNDER THIS ALTERNATIVE, EPA WOULD TAKE NO ACTIONS OTHER THAN PERFORMING REVIEWS EVERY 5 YEARS. UNDER THIS ALTERNATIVE, THERE WOULD BE NO DEED RESTRICTIONS OR ANY OTHER INSTITUTIONAL CONTROLS. ALTERNATIVE 1 WOULD NOT COMPLY WITH THE GROUNDWATER RELEVANT AND APPROPRIATE SAFE DRINKING WATER ACT (SDWA) MAXIMUM CONTAMINANT LEVEL (MCL) OF 50 UG/L ARSENIC, AND POSSIBLY NOT WITH THE PERTINENT RELEVANT AND APPROPRIATE MCLS FOR ORGANIC CHEMICALS. ALTERNATIVE 1 WOULD ALSO NOT COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. WHILE NO CAPITAL COSTS WOULD BE INCURRED UNDER THIS ALTERNATIVE, ANNUAL OPERATION & MAINTENANCE (O&M) COSTS ARE ESTIMATED TO BE $3,600. THIS ALTERNATIVE HAS A PRESENT-WORTH COST OF $56,000, AND CAN BE IMPLEMENTED IMMEDIATELY.

2. ALTERNATIVE 2: SOIL CAPPING

UNDER ALTERNATIVE 2, THE ENTIRE AREA OF SURFACE SOIL CONTAMINATION (ARSENIC CONCENTRATION GREATER THAN 21 MG/KG) (40 ACRES) WOULD BE LEFT IN PLACE AND CAPPED WITH 1.5 FEET OF CLEAN SOIL AND 6 INCHES OF TOPSOIL. EROSION CONTROL MEASURES (E.G., RIPRAP) WOULD BE APPLIED TO THE STREAM CHANNEL. THESE MEASURES WOULD REQUIRE MAINTENANCE INDEFINITELY. DEED RESTRICTIONS WOULD BE PLACED ON AREAS WHERE CONTAMINATED SOILS/SEDIMENTS REMAIN FOLLOWING REMEDIATION; AND LONG-TERM GROUNDWATER MONITORING IN COMPLIANCE WITH THE RELEVANT AND APPROPRIATE REQUIREMENTS OF 40 CFR 264.117 AND 5-YEAR REVIEWS WOULD BE CONDUCTED. ALTERNATIVE 2 WOULD NOT COMPLY WITH THE SDWA MCL FOR ARSENIC, AND POSSIBLY NOT WITH THE PERTINENT MCLS FOR ORGANIC CHEMICALS. ALTERNATIVE 2 WOULD ALSO NOT COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COST OF THIS ALTERNATIVE IS $4,440,000. ANNUAL O&M COSTS ARE ESTIMATED TO BE $7,600. THE ESTIMATED PRESENT-WORTH COST OF THIS ALTERNATIVE IS $4,450,000. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 2 YEARS.

3. ALTERNATIVE 3: IMPERMEABLE CAPPING

UNDER ALTERNATIVE 3, BUILDINGS 4, 9, 11, AND 14 WOULD BE DEMOLISHED AND THE PIPELINE/PUMP STATION WOULD BE TEMPORARILY ABANDONED OR RELOCATED TO FACILITATE THE EXCAVATION OF CONTAMINATED SOILS/SEDIMENTS. THE DEMOLITION DEBRIS WOULD EITHER BE LANDFILLED OFFSITE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OR SALVAGED. SATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED SOIL ACTION LEVELS FOR SATURATED SOILS AND UNSATURATED SOILS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED SOIL ACTION LEVELS FOR UNSATURATED SOILS WOULD BE CONSOLIDATED IN THE VADOSE ZONE ONSITE. THE EXCAVATION AREAS WOULD BE BACKFILLED WITH CLEAN FILL OR LIGHTLY CONTAMINATED SOIL. DURING EXCAVATION OF THE SATURATED SOILS AND STREAM

SEDIMENTS, THE GROUNDWATER TABLE WOULD BE LOWERED BY GROUNDWATER PUMPING, AND TULPEHOCKEN CREEK/UNION CANAL WOULD BE TEMPORARILY RELOCATED. THE EXTRACTED CONTAMINATED GROUNDWATER WOULD BE TREATED IN THE GROUNDWATER PUMP-AND-TREAT SYSTEM, IF PRESENT, OR IN A TEMPORARY TREATMENT SYSTEM. THE EXTRACTED UNCONTAMINATED GROUNDWATER WOULD BE DIRECTLY DISCHARGED TO THE CREEK. THE FINAL STREAM CHANNEL WOULD BE LOCATED IN A SIMILAR POSITION AND WITH SIMILAR DIMENSIONS AS THE CURRENT CHANNEL. EROSION CONTROL MEASURES WOULD BE IMPLEMENTED DURING THE STREAM RELOCATION PROCESS. THE ONSITE CANAL LOCK WOULD BE ARCHIVED DURING REMEDIATION AND WOULD BE REINSTALLED AT THE COMPLETION OF ACTIVITIES.

FOLLOWING CONSOLIDATION OF THE EXCAVATED SOILS/SEDIMENTS, THE APPROXIMATELY 100,000 CY OF SOILS WITH CONTAMINANT CONCENTRATIONS ABOVE THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD BE IMPERMEABLY CAPPED (E.G., WITH CLAY). THE CAP WOULD BE DESIGNED TO MEET THE RELEVANT AND APPROPRIATE RCRA LANDFILL CLOSURE REQUIREMENTS IN 40 CFR 264.310, WHICH, AMONG OTHER THINGS, SPECIFY THAT THE PERMEABILITY OF THE CAP MUST BE LESS THAN OR EQUAL TO THE PERMEABILITY OF THE NATURAL UNDERLYING MATERIALS AT THE SITE. ALL SURFACE SOILS THAT ARE NOT IMPERMEABLY CAPPED AND CONTAIN GREATER THAN 21 MG/KG ARSENIC WOULD BE CAPPED WITH SOIL. ALL AFFECTED AREAS WOULD BE GRADED AND REVEGETATED.

FOLLOWING IMPLEMENTATION OF ALTERNATIVE 3, DEED RESTRICTIONS WOULD BE PLACED ON AREAS WHERE CONTAMINATED SOILS/SEDIMENTS REMAIN. CONSISTENT WITH THE RELEVANT AND APPROPRIATE REQUIREMENTS OF 40 CFR 264.117, LONG-TERM O&M WOULD BE CONDUCTED TO MONITOR THE GROUNDWATER AROUND THE CONSOLIDATED WASTES AND TO ENSURE THE INTEGRITY OF THE CAP, AND 5-YEAR REVIEWS WOULD BE CONDUCTED. ALTERNATIVE 3 SHOULD COMPLY WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS).

ALTERNATIVE 3 WOULD NOT COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COST OF THIS ALTERNATIVE IS $8,400,000. ANNUAL O&M COSTS ARE ESTIMATED TO BE $7,600. THE ESTIMATED PRESENT-WORTH COST OF THIS ALTERNATIVE IS $8,300,000. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 2 YEARS.

4. ALTERNATIVE 4: BULK EXCAVATION/LANDFILL

UNDER ALTERNATIVE 4, SOME OR ALL OF THE CONTAMINATED SOILS WOULD BE EXCAVATED AND DISPOSED OFFSITE. THE APPROXIMATELY 61,000 CY OF SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE "PRINCIPAL THREAT" ACTION LEVELS (SEE TABLE 1) WOULD BE DISPOSED IN AN OFFSITE LANDFILL IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS. SINCE NEARLY ALL OF THESE SOILS EXHIBIT THE TOXICITY CHARACTERISTIC FOR ARSENIC, THEY WOULD BE DISPOSED IN A HAZARDOUS WASTE LANDFILL. THE APPROXIMATELY 39,000 CY OF SOILS/SEDIMENTS WHICH CONTAIN CONTAMINANT CONCENTRATIONS LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS BUT GREATER THAN THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS (SEE TABLE 1) WOULD EITHER BE DISPOSED OFFSITE IN AN INTERMEDIATE LANDFILL (OPTIONS A OR B) OR BE CONSOLIDATED IN AN ONSITE VADOSE ZONE AND COVERED BY AN IMPERMEABLE CAP (OPTION C). THE IMPERMEABLE CAP WOULD BE DESIGNED TO MEET THE RELEVANT AND APPROPRIATE REQUIREMENTS OF RCRA LANDFILL CLOSURE IN 40 CFR 264.310. THE BALANCE OF THE CONTAMINATED SOILS WOULD EITHER BE TAKEN OFFSITE TO A LESS SECURE, NONHAZARDOUS LANDFILL (OPTION A) OR REMAIN ONSITE. IF THESE SOILS ARE LEFT ONSITE (OPTIONS B AND C), SATURATED SOILS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED SATURATED SOIL ACTION LEVELS (SEE TABLE 1) WOULD BE RELOCATED TO THE VADOSE ZONE ONSITE. FOLLOWING THIS CONSOLIDATION, SURFACE SOILS WITH ARSENIC CONCENTRATIONS GREATER THAN 21 MG/KG ARSENIC BUT WITH CONTAMINANT CONCENTRATIONS LESS THAN THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD BE COVERED BY A SOIL CAP.

OTHER ACTIVITIES REQUIRED TO IMPLEMENT THIS ALTERNATIVE INCLUDE DEMOLITION OF BUILDINGS 4, 8, 9, 11, AND 14 AND TEMPORARY ABANDONMENT OR RELOCATION OF THE PIPELINE/PUMP STATION. THE DEMOLITION DEBRIS WOULD

EITHER BE LANDFILLED IN AN OFFSITE LANDFILL IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS OR SALVAGED. DURING EXCAVATION OF THE SATURATED SOILS AND STREAM SEDIMENTS, THE GROUNDWATER TABLE WOULD BE LOWERED BY GROUNDWATER PUMPING, AND TULPEHOCKEN CREEK/UNION CANAL WOULD BE TEMPORARILY RELOCATED. THE EXTRACTED CONTAMINATED GROUNDWATER WOULD BE TREATED IN THE GROUNDWATER PUMP-AND-TREAT SYSTEM, IF PRESENT, OR IN A TEMPORARY TREATMENT SYSTEM. THE EXTRACTED UNCONTAMINATED GROUNDWATER WOULD BE DIRECTLY DISCHARGED TO THE CREEK. THE FINAL STREAM CHANNEL WOULD BE LOCATED IN A SIMILAR POSITION AND WITH SIMILAR DIMENSIONS AS THE CURRENT CHANNEL. EROSION CONTROL MEASURES WOULD BE IMPLEMENTED DURING THE STREAM RELOCATION PROCESS. THE ONSITE CANAL LOCK WOULD BE ARCHIVED DURING REMEDIATION AND WOULD BE REINSTALLED AT THE COMPLETION OF ACTIVITIES. THE EXCAVATED AREAS WOULD BE BACKFILLED WITH CLEAN FILL, COVERED WITH SOIL, GRADED, AND REVEGETATED.

OPTION A WOULD COMPLY WITH RCRA LANDFILL CLEAN CLOSURE REQUIREMENTS, 40 CFR PART 264, SUBPART N. THEREFORE, DEED RESTRICTIONS WOULD NOT BE REQUIRED FOR THIS OPTION. FOR OPTIONS B AND C, DEED RESTRICTIONS WOULD BE USED TO CONTROL ACCESS TO THE CONTAMINATED SOILS REMAINING AT THE SITE. SINCE CONTAMINANTS REMAIN ONSITE UNDER OPTIONS B AND C, 5-YEAR REVIEWS WOULD BE CONDUCTED. LONG-TERM GROUNDWATER MONITORING IN COMPLIANCE WITH THE RELEVANT AND APPROPRIATE REQUIREMENTS OF 40 CFR 264.117 WOULD ALSO BE CONDUCTED FOLLOWING IMPLEMENTATION OF OPTION C, SINCE MATERIALS WHICH POSE A POTENTIAL THREAT TO GROUNDWATER WOULD REMAIN ON SITE.

NONE OF THE ALTERNATIVE 4 OPTIONS WOULD COMPLY WITH RCRA LAND DISPOSAL RESTRICTIONS (LDRS, 40 CFR PART 268). THESE RESTRICTIONS REQUIRE RCRA HAZARDOUS WASTES, SUCH AS THE SOILS/SEDIMENTS EXHIBITING THE ARSENIC TOXICITY CHARACTERISTIC, TO BE TREATED PRIOR TO PLACEMENT IN A LANDFILL. THESE RESTRICTIONS APPLY TO THE SOILS/SEDIMENTS AFTER MAY 8, 1992. SINCE IT WOULD BE IMPOSSIBLE TO LANDFILL THE HAZARDOUS SOILS/SEDIMENTS PRIOR TO THIS DATE (BECAUSE OF THE TIME REQUIRED FOR STREAM AND PIPELINE RELOCATION), THIS ARAR WOULD NOT BE MET. ALTERNATIVE 4 COMPLIES WITH ALL OTHER ARARS.

ALTERNATIVE 4 WOULD NOT COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL, ANNUAL O & M, AND NET PRESENT-WORTH COSTS ASSOCIATED WITH THIS ALTERNATIVE ARE $82,000,000, $4,000/YEAR, AND $80,000,000, RESPECTIVELY, FOR OPTION A; $40,000,000, $7,600/YEAR, AND $39,000,000, RESPECTIVELY, FOR OPTION B; AND $34,000,000, $7,600/YEAR, AND $33,000,000, RESPECTIVELY, FOR OPTION C. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 2 YEARS.

5. ALTERNATIVE 5: BULK EXCAVATION/FIXATION/OFFSITE LANDFILL

UNDER ALTERNATIVE 5, ALL SATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR SATURATED SOILS WOULD BE EXCAVATED, AS WOULD ALL OF THOSE UNSATURATED SOILS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE "PRINCIPAL THREAT" ACTION LEVELS (SEE TABLE 1). ADDITIONALLY, THE UNSATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR UNSATURATED SOILS BUT LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS WOULD BE CONSOLIDATED IN THE VADOSE ZONE ONSITE. TO FACILITATE THE EXCAVATION OF THESE APPROXIMATELY 116,000 CY OF CONTAMINATED SOILS/SEDIMENTS, BUILDINGS 4, 9, 11, AND 14 WOULD BE DEMOLISHED AND THE PIPELINE/PUMP STATION WOULD BE TEMPORARILY ABANDONED OR RELOCATED. THE DEMOLITION DEBRIS WOULD EITHER BE LANDFILLED OFFSITE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OR SALVAGED. THE EXCAVATION AREAS WOULD BE BACKFILLED WITH CLEAN FILL OR LIGHTLY CONTAMINATED SOIL. DURING EXCAVATION OF THE SATURATED SOILS AND STREAM SEDIMENTS, THE GROUNDWATER TABLE WOULD BE LOWERED BY GROUNDWATER PUMPING, AND TULPEHOCKEN CREEK/UNION CANAL WOULD BE TEMPORARILY RELOCATED. THE EXTRACTED CONTAMINATED GROUNDWATER WOULD BE TREATED IN THE GROUNDWATER PUMP-AND-TREAT SYSTEM, IF PRESENT, OR IN A TEMPORARY TREATMENT SYSTEM. THE EXTRACTED UNCONTAMINATED GROUNDWATER WOULD BE

DIRECTLY DISCHARGED TO THE CREEK. THE FINAL STREAM CHANNEL WOULD BE LOCATED IN A SIMILAR POSITION AND WITH SIMILAR DIMENSIONS AS THE CURRENT CHANNEL. EROSION CONTROL MEASURES WOULD BE IMPLEMENTED DURING THE STREAM RELOCATION PROCESS. THE ONSITE CANAL LOCK WOULD BE ARCHIVED DURING REMEDIATION AND WOULD BE REINSTALLED AT THE COMPLETION OF ACTIVITIES.

THE APPROXIMATELY 61,000 CY OF "PRINCIPAL THREAT" SOILS/SEDIMENTS WOULD BE TREATED USING IRON-BASED FIXATION OR A SIMILAR PROCESS. THE APPROXIMATELY 5,600 CY OF "PRINCIPAL THREAT" SOILS/SEDIMENTS WITH ORGANIC CHEMICAL CONCENTRATIONS ABOVE THE "PRINCIPAL THREAT" ORGANIC CHEMICAL SOIL ACTION LEVELS WOULD ALSO BE FIXATED WITH ACTIVATED CARBON. FOLLOWING TREATMENT, THE ARSENIC MOBILITY OF THE TREATED WASTES WOULD BE REDUCED BY AT LEAST 90 PERCENT. THE FIXATION WOULD OCCUR ONSITE IN ACCORDANCE WITH RCRA STANDARDS FOR MISCELLANEOUS TREATMENT UNITS (40 CFR PART 264, SUBPART X). THE FIXATION UNIT WOULD BE MOBILIZED, OPERATED, AND CLOSED ACCORDING TO THE REQUIREMENTS OF 40 CFR 264.600, ET SEQ. THE SPECIFIC OPERATING PARAMETERS FOR THE FIXATION PROCESS WOULD BE DETERMINED IN THE REMEDIAL DESIGN PHASE THROUGH ENGINEERING DESIGN AND ANALYSIS AND THE COMPETITIVE BIDDING PROCESS. BECAUSE MOST OF THE "PRINCIPAL THREAT" SOILS/SEDIMENTS EXHIBIT THE RCRA CHARACTERISTIC OF ARSENIC TOXICITY AND ALTERNATIVE 5 CONSTITUTES TREATMENT, RCRA SUBTITLE C IS APPLICABLE. THE RCRA LAND DISPOSAL RESTRICTION TREATMENT STANDARD FOR THESE WASTES IS 5.0 MG/L ARSENIC, AS MEASURED BY THE EP TOXICITY TEST OR TCLP. (A NATIONAL CAPACITY EXTENSION FOR THESE WASTES IS IN EFFECT UNTIL MAY 8, 1992.) THE FIXATION PROCESS SHOULD ACHIEVE THIS TREATMENT STANDARD. THE TREATED SOILS/SEDIMENTS SHOULD NO LONGER BE RCRA CHARACTERISTIC WASTES AS THE FIXATION PROCESS WOULD PREVENT THESE MATERIALS FROM EXCEEDING THE TCLP LIMIT FOR ARSENIC; THEY WOULD BE CONSIDERED RESIDUAL WASTES UNDER PENNSYLVANIA LAW (25 PA CODE, CHAPTER 75). ALL TREATED SOILS WOULD BE LANDFILLED OFF SITE IN AN INTERMEDIATE (RESIDUAL WASTE) LANDFILL. OFFSITE LANDFILL DISPOSAL WOULD COMPLY WITH ALL ARARS.

THE APPROXIMATELY 39,000 CY OF SOILS/SEDIMENTS SITE WITH CONTAMINANT CONCENTRATIONS LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS BUT ABOVE THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD BE CONSOLIDATED ONSITE IN THE VADOSE ZONE AND CAPPED WITH IMPERMEABLE MATERIAL. THE CAP WOULD BE DESIGNED TO MEET THE RELEVANT AND APPROPRIATE REQUIREMENTS OF RCRA LANDFILL CLOSURE IN 40 CFR 264.310. THE REMAINING APPROXIMATELY 16,000 CY OF EXCAVATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS LESS THAN THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD BE PLACED ONSITE IN THE VADOSE ZONE. ALL SOILS REMAINING ON THE SURFACE AFTER THE IMPERMEABLE CAP IS PLACED AND WHICH CONTAIN GREATER THAN 21 MG/KG ARSENIC,BUT LESS THAN THE GROUNDWATER BASED UNSATURATED SOIL ACTION LEVELS, WOULD BE CAPPED WITH SOIL. ALL AFFECTED AREAS WOULD BE GRADED AND REVEGETATED. FOLLOWING IMPLEMENTATION OF ALTERNATIVE 5, DEED RESTRICTIONS WOULD BE PLACED ON AREAS WHERE CONTAMINATED SOILS/SEDIMENTS REMAIN. SINCE CONTAMINANTS REMAIN ONSITE UNDER ALTERNATIVE 5, 5-YEAR REVIEWS WOULD BE CONDUCTED. LONG-TERM GROUNDWATER MONITORING IN COMPLIANCE WITH THE RELEVANT AND APPROPRIATE REQUIREMENTS OF 40 CFR 264.117 WOULD ALSO BE CONDUCTED FOLLOWING IMPLEMENTATION OF ALTERNATIVE 5, SINCE MATERIALS WHICH POSE A POTENTIAL THREAT TO GROUNDWATER WOULD REMAIN ON SITE.

ALTERNATIVE 5 WOULD COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COST OF THIS ALTERNATIVE IS $28,000,000. ANNUAL O&M COSTS ARE ESTIMATED TO BE $7,600. THE ESTIMATED PRESENT-WORTH COST OF THIS ALTERNATIVE IS $27,000,000. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 3 YEARS.

6. ALTERNATIVE 6: BULK EXCAVATION/BIOLOGICAL TREATMENT, FIXATION/OFFSITE LANDFILL

UNDER ALTERNATIVE 6, ALL SATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR SATURATED SOILS WOULD BE EXCAVATED, AS WOULD ALL OF THOSE UNSATURATED

SOILS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE "PRINCIPAL THREAT" ACTION LEVELS (SEE TABLE 1). ADDITIONALLY, THE UNSATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR UNSATURATED SOILS BUT LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS WOULD BE CONSOLIDATED IN THE VADOSE ZONE ONSITE. TO FACILITATE THE EXCAVATION OF THESE APPROXIMATELY 116,000 CY OF CONTAMINATED SOILS/SEDIMENTS, BUILDINGS 4, 9, 11, AND 14 WOULD BE DEMOLISHED AND THE PIPELINE/PUMP STATION WOULD BE TEMPORARILY ABANDONED OR RELOCATED. THE DEMOLITION DEBRIS WOULD EITHER BE LANDFILLED OFFSITE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OR SALVAGED. THE EXCAVATION AREAS WOULD BE BACKFILLED WITH CLEAN FILL OR LIGHTLY CONTAMINATED SOIL. DURING EXCAVATION OF THE SATURATED SOILS AND STREAM SEDIMENTS, THE GROUNDWATER TABLE WOULD BE LOWERED BY GROUNDWATER PUMPING, AND TULPEHOCKEN CREEK/UNION CANAL WOULD BE TEMPORARILY RELOCATED. THE EXTRACTED CONTAMINATED GROUNDWATER WOULD BE TREATED IN THE GROUNDWATER PUMP-AND-TREAT SYSTEM, IF PRESENT, OR IN A TEMPORARY TREATMENT SYSTEM. THE EXTRACTED UNCONTAMINATED GROUNDWATER WOULD BE DIRECTLY DISCHARGED TO THE CREEK. THE FINAL STREAM CHANNEL WOULD BE LOCATED IN A SIMILAR POSITION AND WITH SIMILAR DIMENSIONS AS THE CURRENT CHANNEL. EROSION CONTROL MEASURES WOULD BE IMPLEMENTED DURING THE STREAM RELOCATION PROCESS. THE ONSITE CANAL LOCK WOULD BE ARCHIVED DURING REMEDIATION AND WOULD BE REINSTALLED AT THE COMPLETION OF ACTIVITIES.

THE APPROXIMATELY 61,000 CY OF "PRINCIPAL THREAT" SOILS/SEDIMENTS WOULD BE TREATED USING IRON-BASED FIXATION OR A SIMILAR PROCESS. THE APPROXIMATELY 5,600 CY OF "PRINCIPAL THREAT" SOILS/SEDIMENTS WITH ORGANIC CHEMICAL CONCENTRATIONS ABOVE THE "PRINCIPAL THREAT" ORGANIC CHEMICAL SOIL ACTION LEVELS WOULD ALSO BE BIOLOGICALLY TREATED, EITHER BEFORE OR AFTER THE FIXATION STEP. FOLLOWING TREATMENT, THE ARSENIC MOBILITY OF THE TREATED WASTES WOULD BE REDUCED BY AT LEAST 90 PERCENT, AND AN ESTIMATED 50 TO 100 PERCENT OF THE ORGANICS WOULD BE DESTROYED. THE FIXATION AND BIOLOGICAL TREATMENT WOULD OCCUR ONSITE IN ACCORDANCE WITH RCRA STANDARDS FOR MISCELLANEOUS TREATMENT UNITS (40 CFR PART 264, SUBPART X). THE FIXATION AND BIOLOGICAL TREATMENT UNITS WOULD BE MOBILIZED, OPERATED, AND CLOSED ACCORDING TO THE REQUIREMENTS OF 40 CFR 264.600, ET SEQ. THE SPECIFIC OPERATING PARAMETERS FOR THE FIXATION PROCESS WOULD BE DETERMINED IN THE REMEDIAL DESIGN PHASE THROUGH ENGINEERING DESIGN AND ANALYSIS AND THE COMPETITIVE BIDDING PROCESS. A TREATABILITY STUDY WOULD BE CONDUCTED PRIOR TO FULL-SCALE IMPLEMENTATION TO VALIDATE THE BIOLOGICAL TREATMENT. THE SPECIFIC OPERATING PARAMETERS FOR THE BIOLOGICAL TREATMENT PROCESS WOULD BE DETERMINED IN THE REMEDIAL DESIGN PHASE THROUGH THE TREATABILITY STUDY, ENGINEERING DESIGN AND ANALYSIS, AND THE COMPETITIVE BIDDING PROCESS. BECAUSE MOST OF THE "PRINCIPAL THREAT" SOILS/SEDIMENTS EXHIBIT THE RCRA CHARACTERISTIC OF ARSENIC TOXICITY AND ALTERNATIVE 6 CONSTITUTES TREATMENT, RCRA SUBTITLE C IS APPLICABLE. THE RCRA LAND DISPOSAL RESTRICTION TREATMENT STANDARD FOR THESE WASTES IS 5.0 MG/L ARSENIC, AS MEASURED BY THE EP TOXICITY TEST OR TCLP. (A NATIONAL CAPACITY EXTENSION FOR THESE WASTES IS IN EFFECT UNTIL MAY 8, 1992.) THE FIXATION/BIOLOGICAL TREATMENT PROCESS SHOULD ACHIEVE THIS TREATMENT STANDARD. THE TREATED SOILS/SEDIMENTS SHOULD NO LONGER BE RCRA CHARACTERISTIC WASTES AS THE FIXATION PROCESS WOULD PREVENT THESE MATERIALS FROM EXCEEDING THE TCLP LIMIT FOR ARSENIC; THEY WOULD BE CONSIDERED RESIDUAL WASTES UNDER PENNSYLVANIA LAW (25 PA CODE, CHAPTER 75). ALL TREATED SOILS WOULD BE LANDFILLED OFF SITE IN AN INTERMEDIATE (RESIDUAL WASTE) LANDFILL. OFFSITE LANDFILL DISPOSAL WOULD COMPLY WITH ALL ARARS.

THE APPROXIMATELY 39,000 CY OF SOILS/SEDIMENTS SITE WITH CONTAMINANT CONCENTRATIONS LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS BUT ABOVE THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD BE CONSOLIDATED ONSITE IN THE VADOSE ZONE AND CAPPED WITH IMPERMEABLE MATERIAL. THE CAP WOULD BE DESIGNED TO MEET THE RELEVANT AND APPROPRIATE REQUIREMENTS OF RCRA LANDFILL CLOSURE IN 40 CFR 264.310.

THE REMAINING APPROXIMATELY 16,000 CY OF EXCAVATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS LESS THAN THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD ALSO BE PLACED ONSITE IN THE VADOSE ZONE.

AFTER THE IMPERMEABLE CAPPING STEP IS COMPLETED, ALL SOILS REMAINING ON THE SURFACE WHICH CONTAIN GREATER THAN 21 MG/KG ARSENIC WOULD BE CAPPED WITH SOIL. ALL AFFECTED AREAS WOULD BE GRADED AND REVEGETATED. FOLLOWING IMPLEMENTATION OF ALTERNATIVE 6, DEED RESTRICTIONS WOULD BE PLACED ON AREAS WHERE CONTAMINATED SOILS/SEDIMENTS REMAIN. SINCE CONTAMINANTS REMAIN ONSITE UNDER ALTERNATIVE 6, 5-YEAR REVIEWS WOULD BE CONDUCTED. LONG-TERM GROUNDWATER MONITORING IN COMPLIANCE WITH THE RELEVANT AND APPROPRIATE REQUIREMENTS OF 40 CFR 264.117 WOULD ALSO BE CONDUCTED FOLLOWING IMPLEMENTATION OF ALTERNATIVE 6, SINCE MATERIALS WHICH POSE A POTENTIAL THREAT TO GROUNDWATER WOULD REMAIN ON SITE.

ALTERNATIVE 6 WOULD COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COST OF THIS ALTERNATIVE IS $28,000,000. ANNUAL O&M COSTS ARE ESTIMATED TO BE $7,600. THE ESTIMATED PRESENT-WORTH COST OF THIS ALTERNATIVE IS $25,000,000. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 5 YEARS.

7. ALTERNATIVE 7: BULK EXCAVATION/INCINERATION, FIXATION/OFFSITE LANDFILL

UNDER ALTERNATIVE 7, ALL SATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR SATURATED SOILS WOULD BE EXCAVATED, AS WOULD ALL UNSATURATED SOILS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE "PRINCIPAL THREAT" ACTION LEVELS (SEE TABLE 1). ADDITIONALLY, THE UNSATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR UNSATURATED SOILS BUT LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS WOULD BE CONSOLIDATED IN THE VADOSE ZONE ONSITE. TO FACILITATE THE EXCAVATION OF THESE APPROXIMATELY 116,000 CY OF CONTAMINATED SOILS/SEDIMENTS, BUILDINGS 4, 9, 11, AND 14 WOULD BE DEMOLISHED AND THE PIPELINE/PUMP STATION WOULD BE TEMPORARILY ABANDONED OR RELOCATED. THE DEMOLITION DEBRIS WOULD EITHER BE LANDFILLED OFFSITE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OR SALVAGED. THE EXCAVATION AREAS WOULD BE BACKFILLED WITH CLEAN FILL OR LIGHTLY CONTAMINATED SOIL. DURING EXCAVATION OF THE SATURATED SOILS AND STREAM SEDIMENTS, THE GROUNDWATER TABLE WOULD BE LOWERED BY GROUNDWATER PUMPING, AND TULPEHOCKEN CREEK/UNION CANAL WOULD BE TEMPORARILY RELOCATED. THE EXTRACTED CONTAMINATED GROUNDWATER WOULD BE TREATED IN THE GROUNDWATER PUMP-AND-TREAT SYSTEM, IF PRESENT, OR IN A TEMPORARY TREATMENT SYSTEM. THE EXTRACTED UNCONTAMINATED GROUNDWATER WOULD BE DIRECTLY DISCHARGED TO THE CREEK. THE FINAL STREAM CHANNEL WOULD BE LOCATED IN A SIMILAR POSITION AND WITH SIMILAR DIMENSIONS AS THE CURRENT CHANNEL. EROSION CONTROL MEASURES WOULD BE IMPLEMENTED DURING THE STREAM RELOCATION PROCESS. THE ONSITE CANAL LOCK WOULD BE ARCHIVED DURING REMEDIATION AND WOULD BE REINSTALLED AT THE COMPLETION OF ACTIVITIES.

THE APPROXIMATELY 61,000 CY OF "PRINCIPAL THREAT" SOILS/SEDIMENTS WOULD BE TREATED USING IRON-BASED FIXATION OR A SIMILAR PROCESS. THE APPROXIMATELY 5,600 CY OF "PRINCIPAL THREAT" SOILS/SEDIMENTS WITH ORGANIC CHEMICAL CONCENTRATIONS ABOVE THE "PRINCIPAL THREAT" ORGANIC CHEMICAL SOIL ACTION LEVELS WOULD FIRST BE THERMALLY TREATED, FOLLOWED BY FIXATION WITH CEMENT, IRON, OR SIMILAR REAGENTS. FOLLOWING TREATMENT, THE ARSENIC MOBILITY OF THE TREATED WASTES WOULD BE REDUCED BY GREATER THAN 90 PERCENT, AND NEARLY ALL OF THE ORGANIC CONTAMINANTS WOULD BE DESTROYED. THE FIXATION TREATMENT WOULD OCCUR ONSITE IN A MOBILE UNIT, IN ACCORDANCE WITH RCRA STANDARDS FOR MISCELLANEOUS TREATMENT UNITS (40 CFR PART 264, SUBPART X). THE FIXATION UNIT WOULD BE MOBILIZED, OPERATED, AND CLOSED ACCORDING TO THE REQUIREMENTS OF 40 CFR 264.600, ET SEQ. THESE REQUIREMENTS ARE APPLICABLE TO THE SOILS/SEDIMENTS TO BE FIXATED, BECAUSE TREATMENT AND DISPOSAL OF HAZARDOUS WASTE (ARSENIC CHARACTERISTIC WASTES) ARE OCCURRING. THE SPECIFIC OPERATING PARAMETERS FOR THE FIXATION PROCESS WOULD BE DETERMINED IN THE REMEDIAL DESIGN PHASE THROUGH ENGINEERING DESIGN AND ANALYSIS AND THE COMPETITIVE BIDDING PROCESS. THE THERMAL TREATMENT WOULD OCCUR ONSITE IN A MOBILE UNIT, IN ACCORDANCE WITH RCRA 40 CFR PART 264, SUBPART O STANDARDS. THE SPECIFIC TYPE OF INCINERATION PROCESS

(E.G., ROTARY KILN) WOULD BE DETERMINED IN THE REMEDIAL DESIGN PHASE THROUGH ENGINEERING DESIGN AND ANALYSIS AND THE COMPETITIVE BIDDING PROCESS. THE INCINERATION UNIT WOULD BE MOBILIZED, OPERATED, AND CLOSED ACCORDING TO THE REQUIREMENTS OF RCRA PART 264 SUBPART O, 40 CFR 264.340 ET SEQ. THESE REQUIREMENTS ARE APPLICABLE TO THE SOILS/SEDIMENTS TO BE INCINERATED, BECAUSE TREATMENT AND DISPOSAL OF HAZARDOUS WASTE (ARSENIC CHARACTERISTIC WASTES) ARE OCCURRING. SPECIFIC OPERATING PRACTICES NECESSARY TO MEET THE PERFORMANCE OBJECTIVES, INCLUDING A 99.99 PERCENT DESTRUCTION AND REMOVAL EFFICIENCY (DRE) OF STACK EMISSIONS AS REQUIRED BY SUBPART O OF RCRA, WOULD BE DETERMINED THROUGH A TRIAL BURN AT THE SITE AFTER THE INSTALLATION OF THE INCINERATION UNIT. SPECIALIZED AIR POLLUTION CONTROL EQUIPMENT WOULD BE APPLIED DURING THE INCINERATION STEP TO CAPTURE CONTAMINANTS IN THE EXHAUST AIR AND THUS ENSURE COMPLIANCE WITH THE RELEVANT AND APPROPRIATE NAAQS (40 CFR PART 50) AND NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS) (40 CFR PART 61, SUBPART N). A PILOT-SCALE STUDY WOULD BE CONDUCTED PRIOR TO FULL-SCALE IMPLEMENTATION TO ADEQUATELY EVALUATE ARSENIC REMOVAL VERSUS SIZE AND COST FOR THE AIR POLLUTION CONTROL EQUIPMENT. THE SPECIFIC OPERATING PARAMETERS FOR THE THERMAL TREATMENT PROCESS WOULD BE DETERMINED IN THE REMEDIAL DESIGN PHASE THROUGH THE PILOT-SCALE STUDY, ENGINEERING DESIGN AND ANALYSIS, AND THE COMPETITIVE BIDDING PROCESS.

BECAUSE MOST OF THE "PRINCIPAL THREAT" SOILS/SEDIMENTS EXHIBIT THE RCRA CHARACTERISTIC OF ARSENIC TOXICITY AND ALTERNATIVE 7 CONSTITUTES TREATMENT, RCRA SUBTITLE C IS APPLICABLE. THE RCRA LAND DISPOSAL RESTRICTION TREATMENT STANDARD FOR THESE WASTES IS 5.0 MG/L ARSENIC, AS MEASURED BY THE EP TOXICITY TEST OR TCLP. (A NATIONAL CAPACITY EXTENSION FOR THESE WASTES IS IN EFFECT UNTIL MAY 8, 1992.) THE INCINERATION/FIXATION TREATMENT PROCESS SHOULD ACHIEVE THIS TREATMENT STANDARD. THE TREATED SOILS/SEDIMENTS SHOULD NO LONGER BE RCRA CHARACTERISTIC WASTES AS THE FIXATION PROCESS WOULD PREVENT THESE MATERIALS FROM EXCEEDING THE TCLP LIMIT FOR ARSENIC; THEY WOULD BE CONSIDERED RESIDUAL WASTES UNDER PENNSYLVANIA LAW (25 PA CODE, CHAPTER 75). ALL TREATED SOILS WOULD BE LANDFILLED OFF SITE IN AN INTERMEDIATE (RESIDUAL WASTE) LANDFILL. OFFSITE LANDFILL DISPOSAL WOULD COMPLY WITH ALL ARARS.

THE APPROXIMATELY 39,000 CY OF SOILS/SEDIMENTS SITE WITH CONTAMINANT CONCENTRATIONS LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS BUT ABOVE THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD BE CONSOLIDATED ONSITE IN THE VADOSE ZONE AND CAPPED WITH IMPERMEABLE MATERIAL. THE CAP WOULD BE DESIGNED TO MEET THE RELEVANT AND APPROPRIATE REQUIREMENTS OF RCRA LANDFILL CLOSURE IN 40 CFR 264.310.

THE REMAINING APPROXIMATELY 16,000 CY OF EXCAVATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS LESS THAN THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD ALSO BE PLACED ONSITE IN THE VADOSE ZONE. AFTER THE IMPERMEABLE CAPPING STEP IS COMPLETED, ALL SOILS REMAINING ON THE SURFACE WHICH CONTAIN GREATER THAN 21 MG/KG ARSENIC WOULD BE CAPPED WITH SOIL. ALL AFFECTED AREAS WOULD BE GRADED AND REVEGETATED. FOLLOWING IMPLEMENTATION OF ALTERNATIVE 7, DEED RESTRICTIONS WOULD BE PLACED ON AREAS WHERE CONTAMINATED SOILS/SEDIMENTS REMAIN. SINCE CONTAMINANTS REMAIN ONSITE UNDER ALTERNATIVE 7, 5-YEAR REVIEWS WOULD BE CONDUCTED. LONG-TERM GROUNDWATER MONITORING IN COMPLIANCE WITH THE RELEVANT AND APPROPRIATE REQUIREMENTS OF 40 CFR 264.117 WOULD ALSO BE CONDUCTED FOLLOWING IMPLEMENTATION OF ALTERNATIVE 7, SINCE MATERIALS WHICH POSE A POTENTIAL THREAT TO GROUNDWATER WOULD REMAIN ON SITE.

ALTERNATIVE 7 WOULD COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COST OF THIS ALTERNATIVE IS $33,000,000. ANNUAL O&M COSTS ARE ESTIMATED TO BE $7,600. THE ESTIMATED PRESENT-WORTH COST OF THIS ALTERNATIVE IS $32,000,000. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 3 YEARS.

8. ALTERNATIVE 8: IN-SITU VITRIFICATION

UNDER ALTERNATIVE 8, ALL SATURATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR SATURATED SOILS WOULD BE EXCAVATED. ADDITIONALLY, THE UNSATURATED SOILS WITH CONTAMINANT CONCENTRATIONS EXCEEDING THE GROUNDWATER-BASED ACTION LEVELS FOR UNSATURATED SOILS WOULD BE CONSOLIDATED IN THE VADOSE ZONE ONSITE. TO FACILITATE THE EXCAVATION/CONSOLIDATION OF THESE APPROXIMATELY 116,000 CY OF CONTAMINATED SOILS/SEDIMENTS, BUILDINGS 4, 9, 11, AND 14 WOULD BE DEMOLISHED AND THE PIPELINE/PUMP STATION WOULD BE TEMPORARILY ABANDONED OR RELOCATED. THE DEMOLITION DEBRIS WOULD EITHER BE LANDFILLED OFFSITE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OR SALVAGED. THE EXCAVATION AREAS WOULD BE BACKFILLED WITH CLEAN FILL OR LIGHTLY CONTAMINATED SOIL. DURING EXCAVATION OF THE SATURATED SOILS AND STREAM SEDIMENTS, THE GROUNDWATER TABLE WOULD BE LOWERED BY GROUNDWATER PUMPING, AND TULPEHOCKEN CREEK/UNION CANAL WOULD BE TEMPORARILY RELOCATED. THE EXTRACTED CONTAMINATED GROUNDWATER WOULD BE TREATED IN THE GROUNDWATER PUMP-AND-TREAT SYSTEM, IF PRESENT, OR IN A TEMPORARY TREATMENT SYSTEM. THE EXTRACTED UNCONTAMINATED GROUNDWATER WOULD BE DIRECTLY DISCHARGED TO THE CREEK. THE FINAL STREAM CHANNEL WOULD BE LOCATED IN A SIMILAR POSITION AND WITH SIMILAR DIMENSIONS AS THE CURRENT CHANNEL. EROSION CONTROL MEASURES WOULD BE IMPLEMENTED DURING THE STREAM RELOCATION PROCESS. THE ONSITE CANAL LOCK WOULD BE ARCHIVED DURING REMEDIATION AND WOULD BE REINSTALLED AT THE COMPLETION OF ACTIVITIES.

THE APPROXIMATELY 61,000 CY OF "PRINCIPAL THREAT" SOILS/SEDIMENTS WOULD BE CONSOLIDATED ON SITE. THESE SOILS/SEDIMENTS WOULD THEN BE HEATED IN PLACE USING ELECTRICITY PASSING THROUGH ELECTRODES UNTIL THE MIXTURE FORMED A POOL OF MOLTEN GLASS. NEARLY ALL OF THE ORGANIC CONTAMINANTS WOULD BE DESTROYED DURING HEATING, WHILE THE METAL CONTAMINANTS WOULD BECOME TRAPPED IN THE GLASS DURING THE SUBSEQUENT COOLING STEP. THE ARSENIC MOBILITY OF THE TREATED SOILS/SEDIMENTS MIGHT BE REDUCED BY APPROXIMATELY 90 PERCENT. THE VITRIFICATION WOULD BE CONDUCTED WITH A MOBILE UNIT IN ACCORDANCE WITH RCRA STANDARDS FOR MISCELLANEOUS TREATMENT UNITS (40 CFR PART 264, SUBPART X). THESE STANDARDS HAVE BEEN DETERMINED TO BE RELEVANT AND APPROPRIATE TO THE VITRIFICATION STEP BECAUSE PLACEMENT IS NOT OCCURRING. THE VITRIFICATION UNIT WOULD BE MOBILIZED, OPERATED, AND CLOSED ACCORDING TO THE REQUIREMENTS OF 40 CFR 264.600, ET SEQ. A TREATABILITY STUDY WOULD BE CONDUCTED PRIOR TO FULL-SCALE IMPLEMENTATION TO VALIDATE THE PROPOSED TREATMENT. THE SPECIFIC OPERATING PARAMETERS OF THE VITRIFICATION UNIT WOULD BE DETERMINED IN THE REMEDIAL DESIGN PHASE THROUGH THE TREATABILITY STUDY, ENGINEERING DESIGN AND ANALYSIS, AND THE COMPETITIVE BIDDING PROCESS. SPECIALIZED AIR POLLUTION CONTROL EQUIPMENT WOULD BE APPLIED DURING THE VITRIFICATION STEP TO CAPTURE CONTAMINANTS IN THE EXHAUST AIR AND THUS ENSURE COMPLIANCE WITH THE RELEVANT AND APPROPRIATE NAAQS (40 CFR PART 50) AND NESHAPS (40 CFR PART 61, SUBPART N). RESIDUALS FROM THE AIR POLLUTION CONTROL SYSTEM WOULD BE VITRIFIED IN SUBSEQUENT BATCHES. ONCE THE VITRIFICATION STEP IS COMPLETED, GRAVEL WOULD BE PLACED AROUND THE VITRIFIED MATERIAL TO DIRECT INFILTRATION AND GROUNDWATER AROUND IT. THE GRAVEL WOULD BE COVERED BY A SOIL CAP.

THE APPROXIMATELY 39,000 CY OF SOILS/SEDIMENTS SITE WITH CONTAMINANT CONCENTRATIONS LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS BUT ABOVE THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD BE CONSOLIDATED ONSITE IN THE VADOSE ZONE AND CAPPED WITH IMPERMEABLE MATERIAL. THE CAP WOULD BE DESIGNED TO MEET THE RELEVANT AND APPROPRIATE REQUIREMENTS OF RCRA LANDFILL CLOSURE IN 40 CFR 264.310.

THE REMAINING APPROXIMATELY 16,000 CY OF EXCAVATED SOILS/SEDIMENTS WITH CONTAMINANT CONCENTRATIONS LESS THAN THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD ALSO BE PLACED ONSITE IN THE VADOSE ZONE. AFTER THE IMPERMEABLE CAPPING AND VITRIFIED MATERIALS CAPPING STEPS ARE COMPLETED, ALL SOILS REMAINING ON THE SURFACE WHICH CONTAIN GREATER THAN 21 MG/KG ARSENIC WOULD BE CAPPED WITH SOIL. ALL AFFECTED AREAS WOULD BE GRADED AND REVEGETATED. FOLLOWING IMPLEMENTATION OF ALTERNATIVE 8, DEED RESTRICTIONS WOULD BE PLACED ON AREAS WHERE CONTAMINATED SOILS/SEDIMENTS REMAIN. SINCE CONTAMINANTS REMAIN ONSITE UNDER ALTERNATIVE 8, 5-YEAR REVIEWS WOULD BE CONDUCTED. LONG-TERM GROUNDWATER MONITORING IN

COMPLIANCE WITH THE RELEVANT AND APPROPRIATE REQUIREMENTS OF 40 CFR 264.117 WOULD ALSO BE CONDUCTED FOLLOWING IMPLEMENTATION OF ALTERNATIVE 8, SINCE MATERIALS WHICH POSE A POTENTIAL THREAT TO GROUNDWATER WOULD REMAIN ON SITE.

ALTERNATIVE 8 WOULD COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COST OF THIS ALTERNATIVE IS $45,000,000. ANNUAL O&M COSTS ARE ESTIMATED TO BE $7,600. THE ESTIMATED PRESENT-WORTH COST OF THIS ALTERNATIVE IS $44,000,000. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 3 YEARS.

ALTERNATIVE 9: SOIL FLUSHING

(NOTE: THE WLPSG SUBMITTED AN INITIAL SOIL WASHING (FLUSHING) PROPOSAL TO EPA IN FEBRUARY 1990. THE FORMER OWNERS SUBMITTED SUPPLEMENTAL INFORMATION DESCRIBING THE FORMER OWNERS' SOIL FLUSHING PROPOSAL IN MORE DETAIL TO EPA ON SEPTEMBER 14, 1990. THIS ALTERNATIVE DESCRIPTION, AS WELL AS THE REST OF THIS RECORD OF DECISION, INCORPORATE THE NEW SUPPLEMENTAL INFORMATION.)

UNDER THE FORMER OWNERS' PROPOSAL (ALTERNATIVE 9), A 3-YEAR IN SITU PILOT-SCALE SOIL FLUSHING DEMONSTRATION PROGRAM (TREATABILITY STUDY) WOULD BE CONDUCTED. IN ONE PLACE IN THE FORMER OWNERS' PROPOSAL, IT IS STATED THAT THE OBJECTIVE OF THE PILOT PROGRAM IS TO DETERMINE IF ARSENIC CAN BE LEACHED FROM THE SOIL IN PLACE OVER AN EXTENDED PERIOD OF TIME, AS WELL AS TO PROVIDE AN INITIAL EVALUATION OF SEDIMENT FLUSHING. IN ANOTHER PLACE IT IS STATED THAT THE OBJECTIVE IS TO DETERMINE WHETHER ARSENIC WILL LEACH FROM THE SOILS AT LEVELS ABOVE THE THRESHOLD FOR GROUNDWATER IMPACT. LEACHATE FROM THE SOIL FLUSHING TEST WILL IN THEORY BE CAPTURED BY THE PUMPING NETWORK INSTALLED BY THE FORMER OWNERS AS PART OF THEIR GROUNDWATER REMEDIAL ALTERNATIVE.

ONCE THE 3-YEAR STUDY RESULTS ARE OBTAINED, THEY WOULD BE STUDIED TO DETERMINE IF THE LEACHATE CONCENTRATION IS ABOVE THE THRESHOLD FOR GROUNDWATER IMPACT. THIS THRESHOLD IS DEFINED AS NOT EXCEEDING SDWA MCLS AT THE POINT OF EXPOSURE. A REALISTIC EXPOSURE POINT IS MORE THAN 500 FEET FROM THE SITE BOUNDARY, ACCORDING TO THE FORMER OWNERS. IF SOIL LEACHATE CONCENTRATIONS ARE ABOVE THE FORMER OWNER-DEFINED THRESHOLD, SOILS AND SEDIMENT FLUSHING WOULD BE EXPANDED. IF THE LEACHATE CONCENTRATIONS ARE BELOW THE FORMER OWNER GROUNDWATER IMPACT THRESHOLD, SURFACE SOILS THAT EXCEED ACTION LEVELS PROTECTIVE OF HUMAN HEALTH WOULD BE CAPPED. INSTITUTIONAL CONTROLS WOULD BE APPLIED TO THE ENTIRE SITE PLUS OFF-SITE AREAS THAT ARE CAPPED AND/OR TREATED WITH SOIL FLUSHING.

TO CONDUCT THE PILOT-SCALE STUDY, A PERCOLATION/LEACHING FIELD WOULD BE INSTALLED IN A 20-FOOT BY 20-FOOT, MODERATELY CONTAMINATED AREA. A WALL WOULD BE CONSTRUCTED AROUND THE PERIMETER OF THE LEACHING AREA TO CONTROL THE LATERAL MIGRATION OF WASHING SOLUTION. HORIZONTAL DRAIN PIPES WOULD BE INSTALLED UNDER THE SOILS TO BE LEACHED TO COLLECT THE LEACHING FLUID. LEACHATE PRODUCED DURING THE STUDY WOULD BE TREATED IN THE GROUNDWATER PUMP-AND-TREAT SYSTEM. ADDITIONAL SOIL AND SEDIMENT WASHING TESTING WOULD BE CONDUCTED IN A MOBILE LABORATORY ON SITE.

ALTERNATIVE 9 WOULD NOT COMPLY WITH THE GROUNDWATER RELEVANT AND APPROPRIATE REQUIREMENT OF 50 UG/L ARSENIC FOR THE ENTIRE GROUNDWATER PLUME AREA OF ATTAINMENT, AND POSSIBLY NOT WITH THE PERTINENT RELEVANT AND APPROPRIATE MCLS FOR ORGANIC CHEMICALS. THIS NONCOMPLIANCE OCCURS BECAUSE A REMEDIAL OBJECTIVE IS TO NOT EXCEED MCLS AT A REALISTIC EXPOSURE POINT. (A REALISTIC EXPOSURE POINT IS MORE THAN 500 FEET FROM THE SITE BOUNDARY, ACCORDING TO THE FORMER OWNERS.) THE GROUNDWATER PLUME CLOSER TO THE SITE WOULD BE ALLOWED TO EXCEED MCLS AT THE COMPLETION OF THE REMEDIATION. ADDITIONALLY, SINCE ONLY A SMALL AREA OF SOIL CONTAMINATION WOULD BE ADDRESSED DURING THE 3-YEAR PILOT PROGRAM, THE REMAINING AREA OF SOIL CONTAMINATION WOULD CONTINUE TO LEACH CONTAMINANTS TO THE GROUNDWATER AND CAUSE MCLS TO BE EXCEEDED DURING

THIS PERIOD.

THE FORMER OWNERS ESTIMATE THE TOTAL COST OF THEIR DEMONSTRATION PROGRAM, INCLUDING TWO YEARS OF O&M, AT $1,400,000. THE FORMER OWNERS ESTIMATE THAT THE PRESENT WORTH COST OF THE SOIL MAXIMUM EXPANSION, INCLUDING 27 YEARS OF O&M, AT $7,300,000. THIS FIGURE INCLUDES COSTS FOR SOIL CAPPING AND INSTITUTIONAL CONTROLS. THUS THE TOTAL COST OF ALTERNATIVE 9 FOR MAXIMUM EXPANSION IS $8,700,000. THE MAXIMUM EXPANSION WOULD ENCOMPASS AN ESTIMATED 15.6 ACRES.

10. COMPARATIVE ANALYSIS OF ALTERNATIVES - SOILS/SEDIMENTS

THE NINE SOIL/SEDIMENT REMEDIAL ACTION ALTERNATIVES DESCRIBED ABOVE AND THE SELECTED REMEDY WERE EVALUATED UNDER THE NINE EVALUATION CRITERIA IN THE NCP 40 CFR 300.430(E)(9) AS SET FORTH IN "GUIDANCE FOR CONDUCTING REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES UNDER CERCLA" (EPA, OCTOBER 1988), EPA DIRECTIVE 9355.3-02 "DRAFT GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: THE PROPOSED PLAN AND RECORD OF DECISION," AND "GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: THE PROPOSED PLAN, THE RECORD OF DECISION, EXPLANATION OF SIGNIFICANT DIFFERENCES, AND THE RECORD OF DECISION AMENDMENT" (EPA/540/6-89/007, JULY 1989 INTERIM FINAL). THESE NINE CRITERIA CAN BE FURTHER CATEGORIZED INTO THREE GROUPS: THRESHOLD CRITERIA, PRIMARY BALANCING CRITERIA, AND MODIFYING CRITERIA, AS FOLLOWS:

THRESHOLD CRITERIA

* OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
* COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

PRIMARY BALANCING CRITERIA

* LONG-TERM EFFECTIVENESS
* REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT
* SHORT-TERM EFFECTIVENESS
* IMPLEMENTABILITY
* COST

MODIFYING CRITERIA

* COMMUNITY ACCEPTANCE
* STATE ACCEPTANCE

THESE EVALUATION CRITERIA, WHICH MEASURE THE OVERALL FEASIBILITY AND ACCEPTABILITY OF THE REMEDY, RELATE DIRECTLY TO REQUIREMENTS IN SECTION 121 OF CERCLA, 42 USC SECTION 9621. THRESHOLD CRITERIA MUST BE SATISFIED IN ORDER FOR A REMEDY TO BE ELIGIBLE FOR SELECTION. PRIMARY BALANCING CRITERIA ARE USED TO WEIGH MAJOR TRADE-OFFS BETWEEN ALTERNATIVES. STATE AND COMMUNITY ACCEPTANCE ARE MODIFYING CRITERIA FORMALLY TAKEN INTO ACCOUNT AFTER PUBLIC COMMENT IS RECEIVED ON THE PROPOSED PLAN. THE EVALUATIONS ARE AS FOLLOWS:

OVERALL PROTECTION.

ALTERNATIVES 3, 4, 5, 6, 7, AND 8 WOULD PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT BY ELIMINATING, REDUCING, OR CONTROLLING RISK THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL CONTROLS. ALTERNATIVES 5, 6, AND 7 WOULD TREAT THE MOST HEAVILY CONTAMINATED ("PRINCIPAL THREAT") SOILS/SEDIMENTS AND DISPOSE THESE TREATED MATERIALS OFF SITE. MODERATELY CONTAMINATED SOILS/SEDIMENTS WOULD BE CONSOLIDATED ON SITE. THE CONTAMINATED SOILS/SEDIMENTS REMAINING AT THE SITE WOULD BE CAPPED TO REDUCE THE RISKS ASSOCIATED WITH DIRECT CONTACT AND MINIMIZE THE MIGRATION OF CONTAMINATION TO THE GROUNDWATER.

ALTERNATIVES 5, 6, 7, AND 8 WOULD BE MORE PROTECTIVE THAN THE OTHER

ALTERNATIVES, SINCE THE HEAVILY CONTAMINATED SOILS WOULD BE TREATED TO REDUCE TOXICITY, MOBILITY, OR VOLUME. ALTERNATIVE 5 WOULD BE LESS PROTECTIVE THAN ALTERNATIVES 6, 7, AND 8, SINCE THE ORGANIC CHEMICALS IN THE SOILS/SEDIMENTS WOULD BE FIXATED RATHER THAN DESTROYED. THERE ARE RISKS ASSOCIATED WITH ARSENIC VOLATILIZATION DURING THE INCINERATION OR VITRIFICATION STEPS OF ALTERNATIVES 7 AND 8; THESE RISKS WOULD BE MANAGED THROUGH THE USE OF SPECIALIZED AIR POLLUTION CONTROL EQUIPMENT. ALTERNATIVE 3 WOULD BE LESS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT THAN ALTERNATIVES 5, 6, 7, AND 8, BECAUSE THE HEAVILY CONTAMINATED WASTES WOULD REMAIN UNTREATED AND THERE IS THE POTENTIAL OF CONTAINMENT SYSTEM FAILURE FROM SINKHOLE FORMATION, EROSION, OR OTHER CAUSES. CONTAINMENT SYSTEM FAILURE COULD RESULT IN A SUBSTANTIAL RELEASE OF CONTAMINANTS TO GROUNDWATER.

ALTERNATIVE 2 WOULD NOT BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, AS PRECIPITATION INFILTRATION WOULD CONTINUE TO CAUSE SUBSTANTIAL GROUNDWATER CONTAMINATION.

ALTERNATIVE 9 WOULD BE LESS PROTECTIVE OF HUMAN HEALTH OR THE ENVIRONMENT THAN ALTERNATIVES 5, 6, 7, AND 8. UNDER ALTERNATIVE 9, EITHER NO REMEDIATION OTHER THAN SOIL CAPPING AND INSTITUTIONAL CONTROLS WOULD OCCUR, OR SOIL FLUSHING WOULD BE IMPLEMENTED ON THE MOST CONTAMINATED SOILS. IF ONLY SOIL CAPPING/INSTITUTIONAL CONTROLS OCCUR, THE ALTERNATIVE WOULD ESSENTIALLY BE THE EQUIVALENT OF ALTERNATIVE 2, AND WOULD NOT BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. IF THE MAXIMUM SOIL FLUSHING EXPANSION OCCURS, THERE IS A SIGNIFICANT RISK THAT SOME OF THE LEACHING SOLUTION WOULD ESCAPE THE WELL CAPTURE NETWORK (BECAUSE OF THE SITE'S COMPLEX HYDROGEOLOGY) AND CONTAMINATE DOWNGRADIENT GROUNDWATER. IF SOIL FLUSHING IS IMPLEMENTED, THE FLUSHING DURATION CAN NOT BE SPECIFIED, BECAUSE THE FORMER OWNERS DID NOT SPECIFY A SOIL/SEDIMENT CLEANUP LEVEL. RATHER, THEY SPECIFIED THAT SOILS/SEDIMENTS WOULD BE TREATED UNTIL THE EFFECT OF LEACHATE ON GROUNDWATER WOULD NOT EXCEED MCLS AT THE POINT OF EXPOSURE. (A REALISTIC EXPOSURE POINT IS MORE THAN 500 FEET FROM THE SITE BOUNDARY, ACCORDING TO THE FORMER OWNERS.) USING THE FORMER OWNERS' CALCULATIONS, IT WOULD TAKE 10,000 TO 24,000 YEARS FOR THE MAXIMUM SOIL FLUSHING OPTION FOR SOILS TO BE CLEANED UP TO A POINT WHERE THEIR LEACHATE CONCENTRATION WOULD MEET MCLS. (SEE THE DISCUSSION IN THE ATTACHED RESPONSIVENESS SUMMARY.) THUS, THE SOIL FLUSHING TREATMENT DURATION WOULD LIKELY BE VERY LENGTHY. DURING THIS PERIOD, THE GROUNDWATER CAPTURE NETWORK WOULD HAVE TO BE OPERATED TO PROTECT CURRENT OR POTENTIAL FUTURE DOWNGRADIENT GROUNDWATER USERS.

UNDER THE FORMER OWNERS' PROPOSAL, SOILS/SEDIMENTS WOULD NOT BE REMEDIATED TO A POINT WHERE CONTAMINANT CONCENTRATIONS IN THE ENTIRE AQUIFER WOULD BE AT OR BELOW THE GROUNDWATER CLEANUP LEVELS PRESENTED IN SECTION V ABOVE. RATHER, THEY WOULD ONLY BE REMEDIATED UNTIL A POINT WHERE GROUNDWATER WOULD MEET MCLS AT A POINT AT LEAST 500 FEET BEYOND THE SITE BOUNDARY. IN THE ABSENCE OF MCLS, THE FORMER OWNERS ADVOCATE THE USE OF A 1 X (10-4) EXCESS LIFETIME CANCER RISK-BASED CLEANUP LEVEL FOR CARCINOGENS AND A HAZARD QUOTIENT OF 1 FOR NON-CARCINOGENS. EPA HAS DETERMINED THAT, IN THE ABSENCE OF MCLS, A 1 X (10-6) EXCESS LIFETIME CANCER RISK-BASED STANDARD IS APPROPRIATE FOR GROUNDWATER. GIVEN THE SITE-SPECIFIC CONDITIONS, EPA HAS DETERMINED THAT REDUCING GROUNDWATER CONTAMINANT CONCENTRATIONS AT THE WHITMOYER LABORATORIES SITE TO ONLY A 1 X (10-4) EXCESS LIFETIME CANCER RISK-BASED LEVEL IN THE ABSENCE OF MCLS IS NOT PROTECTIVE OF HUMAN HEALTH. ADDITIONALLY, EPA HAS DETERMINED THAT CONTAMINANT CONCENTRATIONS SHOULD BE REDUCED BELOW MCLS (WHERE THEY EXIST FOR THE CONTAMINANTS) IN THE ENTIRE AQUIFER, AND NOT JUST FOR PORTIONS OF THE AQUIFER AT A SIGNIFICANT DISTANCE DOWNGRADIENT OF THE SITE.

UNDER ALTERNATIVE 9, ONLY MINIMAL ACTIONS WOULD OCCUR DURING THE 3-YEAR PILOT-SCALE PROGRAM. DURING THESE 3 YEARS, GROUNDWATER CONTAMINATION WOULD CONTINUE TO OCCUR AND THE POTENTIAL FOR SURFACE RUNOFF AND INHALATION/INGESTION WOULD CONTINUE TO EXIST.

THE "NO ACTION" ALTERNATIVE IS NOT PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT; THEREFORE, IT IS NOT CONSIDERED FURTHER IN THIS ANALYSIS AS AN OPTION FOR THE SOILS/SEDIMENTS.

COMPLIANCE WITH ARARS

ALTERNATIVES 3, 5, 6, 7, AND 8 WOULD MEET THEIR RESPECTIVE ARARS. ALTERNATIVE 6 WOULD COMPLY WITH THE APPLICABLE LDRS FOR ARSENIC CHARACTERISTIC WASTES, THE APPLICABLE RCRA MISCELLANEOUS TREATMENT UNIT STANDARDS, AND THE RELEVANT AND APPROPRIATE RCRA CLOSURE AND GROUNDWATER MONITORING REQUIREMENTS. ALSO, THE RELEVANT AND APPROPRIATE SDWA GROUNDWATER QUALITY STANDARDS WOULD BE MET.

ALTERNATIVE 4 WOULD NOT BE EXPECTED TO COMPLY WITH THE LDR STANDARDS FOR ARSENIC CHARACTERISTIC WASTES, SINCE THE HEAVILY CONTAMINATED SOILS WOULD NOT BE COMPLETELY LANDFILLED BY MAY 8, 1992. THERE IS A RCRA LAND DISPOSAL RESTRICTION CAPACITY EXTENSION UNTIL THIS DATE - SEE 55 FR 22520. THUS, AN ARAR WAIVER WOULD BE REQUIRED TO IMPLEMENT ALTERNATIVE 4. ALTERNATIVE 2 WOULD NOT COMPLY WITH THE RELEVANT AND APPROPRIATE GROUNDWATER QUALITY STANDARDS. ALTERNATIVE 9 WOULD ALSO NOT COMPLY WITH THE RELEVANT AND APPROPRIATE GROUNDWATER QUALITY STANDARDS, BECAUSE THE SOILS/SEDIMENTS WOULD NOT BE CLEANED UP TO A POINT WHERE THEY WOULD NO LONGER CAUSE THE ENTIRE AQUIFER (AREA OF ATTAINMENT) TO MEET THESE STANDARDS. RATHER, UNDER ALTERNATIVE 9 SOILS/SEDIMENTS WOULD ONLY BE CLEANED UP TO A POINT WHERE GROUNDWATER WOULD MEET THESE STANDARDS AT A POINT OF EXPOSURE A MINIMUM OF 500 FEET DOWNGRADIENT OF THE SITE. ALTERNATIVES 2, 3, AND 4 WOULD NOT CONFORM WITH THE CERCLA PREFERENCE FOR TREATMENT.

LONG-TERM EFFECTIVENESS AND PERMANENCE

ALTERNATIVE 6 WOULD REDUCE THE HAZARDS POSED BY THE SOILS/SEDIMENTS BY FIXATING THE ARSENIC IN THE MOST HEAVILY CONTAMINATED MATERIALS AND BIOLOGICALLY TREATING THE SOILS/SEDIMENTS MOST HEAVILY CONTAMINATED WITH ORGANIC CHEMICALS. THE LONG-TERM RISK OF EXPOSURE TO THE TREATED SOILS/SEDIMENTS WOULD BE REDUCED BY PLACING THESE MATERIALS IN AN OFFSITE LANDFILL. POTENTIAL FUTURE EXPOSURE TO THE LESS CONTAMINATED MATERIALS WOULD BE ADDRESSED BY THE FOLLOWING ENGINEERING AND INSTITUTIONAL CONTROLS: REMOVING SOILS/SEDIMENTS THAT CAN CONTAMINATE GROUNDWATER FROM THE SATURATED ZONE AND OFFSITE LOCATIONS; CONSOLIDATING THE EXCAVATED MATERIALS; CAPPING THE SOILS WHICH PRESENT THE POTENTIAL FOR EXPOSURE IN THE FUTURE; AND PLACING DEED RESTRICTIONS ON CAPPED AREAS.

ALTERNATIVES 7 AND 8 WOULD BE SLIGHTLY MORE PROTECTIVE THAN THE ALTERNATIVE 6, IN THAT A SLIGHTLY HIGHER PERCENTAGE OF THE ORGANIC CONTAMINATION IN THE "PRINCIPAL THREAT" SOILS/SEDIMENTS WOULD BE DESTROYED. ON THE OTHER HAND, ALTERNATIVE 8 WOULD BE LESS PROTECTIVE THAN THE ALTERNATIVES 5, 6, AND 7 SINCE THE TREATED WASTES WOULD NOT BE CONTAINED IN A LANDFILL. ALTERNATIVE 5 WOULD BE LESS EFFECTIVE THAN ALTERNATIVES 6, 7, AND 8 SINCE THE ORGANIC CONTAMINANTS IN THE MOST HEAVILY CONTAMINATED SOILS WOULD BE IMMOBILIZED RATHER THAN DESTROYED.

ALTERNATIVES 5, 6, 7, AND 8 WOULD BE LESS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT THAN OPTIONS A (CLEAN CLOSURE) AND B OF ALTERNATIVE 4, BECAUSE THE APPROXIMATELY 39,000 CY OF SOILS/SEDIMENTS WHICH CONTAIN CONTAMINANT CONCENTRATIONS LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS BUT GREATER THAN THE GROUNDWATER-BASED UNSATURATED SOIL ACTION LEVELS WOULD REMAIN ON SITE, AND THERE IS THE POTENTIAL FOR THE CONTAINMENT (CAPPING) SYSTEM TO FAIL FROM SINKHOLE FORMATION, EROSION, OR OTHER CAUSES. THE ONSITE CONTAINMENT SYSTEM WOULD REQUIRE LONG-TERM MAINTENANCE, AND PORTIONS OF IT MIGHT NEED TO BE REPLACED IN THE FUTURE. (A GROUNDWATER MONITORING SYSTEM WOULD BE PLACED AROUND THE CAPPED AREAS TO ASSESS THE EFFECTIVENESS OF THE REMEDY.) IF DEED RESTRICTIONS ARE NOT EFFECTIVE, DIRECT EXPOSURE TO THE WASTES IN THE FUTURE COULD RESULT FROM CONSTRUCTION ACTIVITIES.

ALTERNATIVES 5, 6, AND 7 WOULD BE MORE EFFECTIVE IN THE LONG-TERM THAN

ALTERNATIVES 2 AND 3, SINCE THE MOST HEAVILY CONTAMINATED ("PRINCIPAL THREAT") SOILS/SEDIMENTS WOULD BE BOTH TREATED AND LANDFILLED OFF SITE. ALTERNATIVES 5, 6, 7, AND 8 WOULD BE MORE PERMANENT THAN ALTERNATIVE 4, SINCE THE HEAVILY CONTAMINATED SOILS WOULD BE TREATED PRIOR TO OFFSITE DISPOSAL.

ALTERNATIVE 9 WOULD BE LESS EFFECTIVE IN THE LONG TERM THAN ALTERNATIVES 5, 6, 7, AND 8. UNDER ALTERNATIVE 9, EITHER NO REMEDIATION OTHER THAN SOIL CAPPING AND INSTITUTIONAL CONTROLS WOULD OCCUR, OR SOIL FLUSHING WOULD BE IMPLEMENTED ON THE MOST CONTAMINATED SOILS. IF ONLY SOIL CAPPING/INSTITUTIONAL CONTROLS OCCUR, THE ALTERNATIVE WOULD ESSENTIALLY BE THE EQUIVALENT OF ALTERNATIVE 2, AND WOULD NOT BE EFFECTIVE IN THE LONG-TERM. IF THE MAXIMUM SOIL FLUSHING EXPANSION OCCURS, AN UNDEFINED QUANTITY OF SOILS WOULD BE TREATED TO REDUCE THEIR CONTAMINANT CONCENTRATION. THIS QUANTITY COULD POTENTIALLY EXCEED THE QUANTITY TO BE TREATED UNDER ALTERNATIVES 5, 6, 7, AND 8. FOR THE SOILS TO BE TREATED UNDER ALTERNATIVE 9, TREATMENT WOULD ONLY OCCUR UNTIL A POINT WHERE LEACHATE CONCENTRATIONS WOULD NOT CAUSE GROUNDWATER TO EXCEED MCLS AT AN UNSPECIFIED POINT AT LEAST 500 FEET BEYOND THE SITE BOUNDARY. IN THE ABSENCE OF MCLS, THE FORMER OWNERS ADVOCATE THE USE OF A 1 X (10-4) EXCESS LIFETIME CANCER RISK-BASED CLEANUP LEVEL FOR CARCINOGENS AND A HAZARD QUOTIENT OF 1 FOR NON-CARCINOGENS. EPA HAS DETERMINED THAT, IN THE ABSENCE OF MCLS, A 1 X (10-6) EXCESS LIFETIME CANCER RISK-BASED STANDARD IS APPROPRIATE FOR GROUNDWATER. GIVEN THE SITE-SPECIFIC CONDITIONS, EPA HAS DETERMINED THAT CLEANING UP GROUNDWATER AT THE WHITMOYER LABORATORIES SITE TO A 1 X (10-4) EXCESS LIFETIME CANCER RISK-BASED LEVEL, IN THE ABSENCE OF MCLS, IS NOT PROTECTIVE OF HUMAN HEALTH. ADDITIONALLY, EPA HAS DETERMINED THAT CONTAMINANT CONCENTRATIONS SHOULD BE REDUCED BELOW MCLS (WHERE THEY EXIST FOR THE CONTAMINANTS) IN THE ENTIRE AQUIFER, AND NOT JUST FOR PORTIONS OF THE AQUIFER AT A SIGNIFICANT DISTANCE DOWNGRADIENT OF THE SITE. THUS, RESIDUAL RISKS WOULD BE HIGHER UNDER ALTERNATIVE 9 THAN UNDER ALTERNATIVES 5, 6, 7, AND 8.

IF THE MAXIMUM SOIL FLUSHING EXPANSION OCCURS, THERE IS A SIGNIFICANT RISK THAT SOME OF THE LEACHING SOLUTION ESCAPING THE WELL CAPTURE NETWORK (BECAUSE OF THE SITE'S COMPLEX HYDROGEOLOGY) AND CONTAMINATING DOWNGRADIENT GROUNDWATER. IF SOIL FLUSHING IS IMPLEMENTED, THE FLUSHING DURATION CAN NOT BE SPECIFIED, BECAUSE THE FORMER OWNERS DID NOT SPECIFY A SOIL/SEDIMENT CLEANUP LEVEL. RATHER, THEY SPECIFIED THAT SOILS/SEDIMENTS WOULD BE TREATED UNTIL THE EFFECT OF LEACHATE ON GROUNDWATER WOULD NOT EXCEED MCLS AT THE POINT OF EXPOSURE. (A REALISTIC EXPOSURE POINT IS MORE THAN 500 FEET FROM THE SITE BOUNDARY, ACCORDING TO THE FORMER OWNERS.) USING THE FORMER OWNER CALCULATIONS, IT WOULD TAKE 10,000 TO 24,000 YEARS FOR THE MAXIMUM SOIL FLUSHING OPTION FOR SOILS TO BE CLEANED UP TO A POINT WHERE THEIR LEACHATE CONCENTRATION WOULD MEET MCLS. (SEE THE DISCUSSION IN THE ATTACHED RESPONSIVENESS SUMMARY.) THUS, THE SOIL FLUSHING TREATMENT DURATION WOULD LIKELY BE VERY LENGTHY. DURING THIS PERIOD, THE GROUNDWATER CAPTURE NETWORK WOULD HAVE TO BE OPERATED TO PROTECT CURRENT OR POTENTIAL FUTURE DOWNGRADIENT GROUNDWATER USERS.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME OF THE CONTAMINANTS

THROUGH TREATMENT. ALTERNATIVES 5, 6, 7, AND 8 WOULD TREAT THE HEAVILY CONTAMINATED SOILS TO REDUCE TOXICITY, MOBILITY, OR VOLUME. ALTERNATIVE 6 WOULD REDUCE THE MOBILITY OF THE ARSENIC IN THE WASTES BY FIXATION WITH IRON, AND WOULD REDUCE THE TOXICITY OF THE SOILS/SEDIMENT HEAVILY CONTAMINATED WITH ORGANICS BY (BIOLOGICALLY TREATING (DESTROYING) THESE CONTAMINANTS. ALTERNATIVES 7 AND 8 WOULD ELIMINATE THE TOXICITY OF THE ORGANIC CONTAMINANTS IN THE WASTES BY THERMAL DESTRUCTION, AND WOULD REDUCE THE MOBILITY OF ARSENIC BY FIXATION FOR ALTERNATIVE 7 AND ENCAPSULATION IN A GLASS MATRIX FOR ALTERNATIVE 8. ALTERNATIVE 5 WOULD REDUCE THE CONTAMINANT MOBILITY BY FIXATION WITH IRON AND ACTIVATED CARBON.

IT IS UNCERTAIN WHAT QUANTITY OF SOILS/SEDIMENTS WOULD BE TREATED UNDER

ALTERNATIVE 9. IF NO FULL-SCALE FLUSHING IS IMPLEMENTED, ONLY A MINOR REDUCTION OF CONTAMINANT MOBILITY AND TOXICITY WOULD BE REALIZED DURING THE 3-YEAR TREATABILITY STUDY. IF THE MAXIMUM EXPANSION IS IMPLEMENTED, THE SOILS WOULD ONLY BE TREATED UNTIL A POINT WHERE LEACHATE CONCENTRATIONS WOULD NOT CAUSE GROUNDWATER TO EXCEED MCLS AT AN UNSPECIFIED POINT AT LEAST 500 FEET BEYOND THE SITE BOUNDARY. SOME ADDITIONAL REDUCTION IN MOBILITY WOULD RESULT FROM THE CAPTURE AND TREATMENT OF CONTAMINANTS. HOWEVER, THE MOBILITY OF THE CONTAMINANTS IN THE TREATED SOILS/SEDIMENTS WOULD REMAIN HIGHER UNDER ALTERNATIVE 9 THAN UNDER ALTERNATIVES 5, 6, 7, AND 8.

NO REDUCTION IN TOXICITY, MOBILITY, OR VOLUME IS REALIZED FOR ALTERNATIVES 2, 3, AND 4. DISPOSAL WITHOUT TREATMENT IS THE LEAST PREFERRED OPTION UNDER CERCLA.

SHORT-TERM EFFECTIVENESS.

UNDER ALTERNATIVES 5 AND 6, THERE WOULD BE A MINIMAL INCREASE IN SHORT-TERM WORKER EXPOSURE RISK DURING THE EXCAVATION, TREATMENT, AND CAPPING STEPS. THE COMMUNITY WOULD ALSO HAVE A MINIMAL SHORT-TERM EXPOSURE RISK FROM FUGITIVE DUST, EROSION AND RUNOFF, AND TRANSPORT OF THE TREATED WASTES OFF SITE. THESE RISKS WOULD BE MINIMIZED BY SAFE OPERATING PRACTICES. SIMILARLY, ALTERNATIVES 2, 3, AND 4 WOULD ONLY POSE MINIMAL SHORT-TERM RISKS.

THERE IS A POTENTIAL RISK ASSOCIATED WITH ARSENIC VOLATILIZATION UNDER ALTERNATIVES 7 AND 8. THIS RISK WOULD BE REDUCED TO ACCEPTABLE LEVELS BY THE USE OF SPECIALIZED AIR POLLUTION CONTROL EQUIPMENT.

ALL OF THE ALTERNATIVES EXCEPT ALTERNATIVES 2 AND 9 INCLUDE A TEMPORARY STREAM RELOCATION PROGRAM. THE TULPEHOCKEN CREEK ECOSYSTEM WOULD BE MODERATELY IMPACTED DURING THIS PROGRAM. THESE EFFECTS WOULD BE MINIMIZED BY EMPLOYING SOUND ECOLOGICAL PRACTICES.

ALTERNATIVE 6 WOULD BE IMPLEMENTED WITHIN AN ESTIMATED 5 YEARS FROM THE REMEDY SELECTION DATE. THIS TIMEFRAME IS NECESSARY FOR EFFICIENT BIOLOGICAL TREATMENT OF THE SOILS/SEDIMENTS HEAVILY CONTAMINATED WITH ORGANIC CHEMICALS. ALL OTHER ALTERNATIVES, WITH THE EXCEPTION OF ALTERNATIVE 9, WOULD REQUIRE MUCH SHORTER TIMEFRAMES (2 TO 3 YEARS).

FULL-SCALE TREATMENT UNDER ALTERNATIVE 9 WOULD NOT COMMENCE FOR A MINIMUM OF 3 YEARS. DURING THIS TIME GROUNDWATER CONTAMINATION WOULD CONTINUE AND THE POTENTIAL FOR SURFACE RUNOFF CONTAMINATION AND DIRECT CONTACT EXPOSURE WOULD REMAIN. THE TIMEFRAME FOR COMPLETION OF ALTERNATIVE 9 DEPENDS ON WHETHER OR NOT FULL-SCALE FLUSHING IS IMPLEMENTED, AND THE TARGET CLEANUP LEVEL OF THE FLUSHING EFFORT IF IMPLEMENTED. IF NO FULL-SCALE FLUSHING IS IMPLEMENTED (ONLY SOIL CAPPING AND PLACEMENT OF INSTITUTIONAL CONTROLS OCCURS), THE REMEDIATION COULD BE COMPLETED 2 TO 3 YEARS AFTER COMPLETION OF THE SOIL FLUSHING DEMONSTRATION PROGRAM. IF SOIL FLUSHING IS IMPLEMENTED, THE FLUSHING DURATION CAN NOT BE SPECIFIED, BECAUSE THE FORMER OWNERS DID NOT SPECIFY A SOIL/SEDIMENT CLEANUP LEVEL. RATHER, THEY SPECIFIED THAT SOILS/SEDIMENTS WOULD BE TREATED UNTIL THE EFFECT OF LEACHATE ON GROUNDWATER WOULD NOT EXCEED MCLS AT THE POINT OF EXPOSURE. (A REALISTIC EXPOSURE POINT IS MORE THAN 500 FEET FROM THE SITE BOUNDARY, ACCORDING TO THE FORMER OWNERS.) USING THE FORMER OWNER CALCULATIONS, IT WOULD TAKE 10,000 TO 24,000 YEARS FOR THE MAXIMUM SOIL FLUSHING OPTION FOR SOILS TO BE CLEANED UP TO A POINT WHERE THEIR LEACHATE CONCENTRATION WOULD MEET MCLS. (SEE THE DISCUSSION IN THE ATTACHED RESPONSIVENESS SUMMARY.) THUS, THE SOIL FLUSHING TREATMENT DURATION WOULD LIKELY BE VERY LENGTHY.

IF THE MAXIMUM SOIL FLUSHING EXPANSION OCCURS, THERE IS A SIGNIFICANT RISK THAT SOME OF THE LEACHING SOLUTION ESCAPING THE WELL CAPTURE NETWORK (BECAUSE OF THE SITE'S COMPLEX HYDROGEOLOGY) AND CONTAMINATING DOWNGRADIENT GROUNDWATER DURING IMPLEMENTATION. DURING SOIL FLUSHING, THE GROUNDWATER CAPTURE NETWORK WOULD HAVE TO BE OPERATED TO PROTECT

CURRENT OR POTENTIAL FUTURE DOWNGRADIENT GROUNDWATER USERS.

IMPLEMENTABILITY

THE VARIOUS ALTERNATIVES HAVE FEW ASSOCIATED ADMINISTRATIVE DIFFICULTIES THAT COULD DELAY IMPLEMENTATION. PERMITS WOULD BE REQUIRED FOR THE OFFSITE DISPOSAL OF THE TREATED MATERIALS (ALTERNATIVES 5, 6, 7, AND 9) OR UNTREATED WASTES (ALTERNATIVE 4). THE IRON FIXATION PROCESS UTILIZED BY ALTERNATIVES 5 AND 6 AND THE SOIL FLUSHING PROGRAM OF ALTERNATIVE 9 ARE RELATIVELY UNPROVEN ON A LARGE SCALE. HOWEVER, REMEDIATION EQUIPMENT AND SPECIALISTS ARE READILY AVAILABLE. BIOLOGICAL TREATMENT OF SOILS HEAVILY CONTAMINATED WITH ARSENIC IS ALSO RELATIVELY UNPROVEN. THESE PROCESSES HAVE BEEN PROVEN ON A SMALL SCALE BASIS. THE IRON FIXATION TREATABILITY STUDY CONDUCTED DURING THE RI/FS INDICATED THAT THE IRON FIXATION STEP IMMOBILIZED THE SOLUBLE ARSENIC IN THE SOILS AND ALLOWED BIOLOGICAL PROCESSES TO OCCUR. BENCH-SCALE OPTIMIZATION STUDIES WOULD BE REQUIRED PRIOR TO IMPLEMENTATION OF ALTERNATIVES 5, 6, AND 7 TO OPTIMIZE REAGENT DOSAGES AND OPERATING CONDITIONS. A 3-YEAR PILOT-SCALE TREATABILITY STUDY WOULD BE REQUIRED PRIOR TO IMPLEMENTATION OF ALTERNATIVE 9. FOR ALTERNATIVES 7, AND 8, TREATMENT EQUIPMENT AND SKILLED WORKERS WOULD BE AVAILABLE BUT LIMITED. FOR ALTERNATIVE 4, HAZARDOUS WASTE DISPOSAL FACILITIES ARE AVAILABLE BUT LIMITED. THE TECHNOLOGY, EQUIPMENT, AND SPECIALISTS REQUIRED TO IMPLEMENT ALTERNATIVES 2, 3, 4, 5, 6, AND 9 WOULD BE READILY AVAILABLE. FOR ALL OF THE ALTERNATIVES, MONITORING OF AIR AND WATER DURING IMPLEMENTATION WOULD BE REQUIRED. FOR ALTERNATIVES 5 THROUGH 9, MONITORING OF THE TREATED WASTES WOULD ALSO BE REQUIRED. PROCESS MONITORING WOULD BE ESPECIALLY IMPORTANT FOR ALTERNATIVE 9, SINCE HEAVILY CONTAMINATED LEACHING SOLUTION COULD ESCAPE THE CONTAINMENT SYSTEM AND CONTAMINATE GROUNDWATER. LONG-TERM GROUNDWATER MONITORING WOULD BE REQUIRED FOR ALL OF THE ALTERNATIVES EXCEPT OPTION A OF ALTERNATIVE 4, TO ESTABLISH THE CONTINUED VIABILITY OF THE ALTERNATIVE.

COST

THE LOWEST-COST ALTERNATIVE IS ALTERNATIVE 2 AT $4,450,000. THE HIGHEST COST ALTERNATIVE IS ALTERNATIVE 4A, AT $80,000,000. THE OTHER FS ALTERNATIVE COSTS ARE PRESENTED IN THE ALTERNATIVE DESCRIPTION SECTIONS.

STATE ACCEPTANCE

THE COMMONWEALTH OF PENNSYLVANIA SUPPORTS THE SELECTION OF ALTERNATIVE 6.

COMMUNITY ACCEPTANCE

A PUBLIC MEETING ON THE PROPOSED PLAN WAS HELD AUGUST 1 IN LEBANON COUNTY, PENNSYLVANIA. COMMENTS RECEIVED FROM THE PUBLIC DURING THE COMMENT PERIOD ARE REFERENCED IN THE RESPONSIVENESS SUMMARY ATTACHED TO THIS RECORD OF DECISION.

B. SUMMARY OF ALTERNATIVES - GROUNDWATER

ALTERNATIVES 1 THROUGH 4 FOR THE GROUNDWATER ARE NUMBERED TO CORRESPOND WITH THE NUMBERS IN THE FIRST FS REPORT (2/90). ALTERNATIVE 5 IS THE ALTERNATIVE PRESENTED BY THE FORMER SITE OWNERS. THE ALTERNATIVES ARE THE FOLLOWING:

* ALTERNATIVE 1: NO ACTION
* ALTERNATIVE 2: PLUME CONTAINMENT
* ALTERNATIVE 3: EXTRACTION (AS GT 1,000 UG/L)/ PHYSICAL, CHEMICAL, (AND BIOLOGICAL) TREATMENT/DISCHARGE
* ALTERNATIVE 4: EXTRACTION OF ALL CONTAMINATED GROUNDWATER/PHYSICAL, CHEMICAL, (AND BIOLOGICAL) TREATMENT/DISCHARGE
* ALTERNATIVE 5: PHASED APPROACH

1. ALTERNATIVE 1: NO ACTION

UNDER THE SUPERFUND PROGRAM, THE "NO ACTION" ALTERNATIVE IS REQUIRED TO BE EVALUATED AT EVERY SITE TO ESTABLISH A BASELINE FOR COMPARISON WITH THE OTHER ALTERNATIVES. FOR THIS ALTERNATIVE, EPA WOULD TAKE NO ACTIONS OTHER THAN MONITORING GROUNDWATER ANNUALLY AND PERFORMING REVIEWS EVERY 5 YEARS. ALTERNATIVE 1 WOULD NOT COMPLY WITH THE RELEVANT AND APPROPRIATE GROUNDWATER QUALITY ARARS (E.G., THE SDWA MCL OF 50 UG/L ARSENIC AND THE STATE HAZARDOUS WASTE REGULATION REQUIREMENT OF CLEANING UP GROUNDWATER TO BACKGROUND CONCENTRATIONS). WHILE NO CAPITAL COSTS WOULD BE INCURRED UNDER THIS ALTERNATIVE, ANNUAL OPERATION & MAINTENANCE (O&M) COSTS ARE ESTIMATED TO BE $13,400. THIS ALTERNATIVE HAS A PRESENT-WORTH COST OF $200,000, AND CAN BE IMPLEMENTED IMMEDIATELY.

2. ALTERNATIVE 2: PLUME CONTAINMENT

UNDER ALTERNATIVE 2, A NETWORK OF GROUNDWATER COLLECTION WELLS WOULD BE ESTABLISHED NEAR THE PERIMETER OF THE CONTAMINATED GROUNDWATER PLUME. THESE WELLS WOULD BE OPERATED TO ONLY REMOVE ENOUGH GROUNDWATER FROM THE AQUIFER TO KEEP THE CONTAMINANT PLUME FROM GROWING. FRACTURING METHODS (E.G., HYDROFRACTURING OR BLASTING) COULD BE USED TO ENHANCE THE GROUNDWATER REMOVAL SYSTEM. AN ESTIMATED 150 GALLONS PER MINUTE (GPM) OF GROUNDWATER WOULD BE REMOVED.

THE EXTRACTED GROUNDWATER WOULD BE TREATED IN AN ONSITE TREATMENT PLANT CONSTRUCTED AND OPERATED IN COMPLIANCE WITH 40 CFR 264.600 ET SEQ. THE TREATMENT PLANT WOULD UTILIZE PHYSICAL, CHEMICAL AND POSSIBLY BIOLOGICAL PROCESSES. BENCH-SCALE STUDIES WOULD BE CONDUCTED PRIOR TO FULL-SCALE DESIGN, TO OPTIMIZE THE TREATMENT PROCESS AND DETERMINE IF BIOLOGICAL TREATMENT WOULD BE APPROPRIATE. AN EXTENSIVE AQUIFER TESTING PROGRAM WOULD ALSO BE REQUIRED PRIOR TO DESIGN OF THE TREATMENT PLANT. THE TREATED WATER WOULD EITHER BE DISCHARGED TO TULPEHOCKEN CREEK (CREEK DISCHARGE OPTION), REINJECTED INTO THE AQUIFER (REINJECTION OPTION), OR DISPOSED USING A COMBINATION OF THE TWO METHODS. TREATED WATER DISPOSAL WOULD COMPLY WITH ALL ARARS {E.G., PENNSYLVANIA WATER QUALITY STANDARDS (25 PA CODE, CHAPTER 93) AND PENNSYLVANIA WASTEWATER DISCHARGE STANDARDS (25 PA CODE, CHAPTER 92)}. TREATMENT PLANT RESIDUALS WOULD BE CONSIDERED RESIDUAL WASTES UNDER PENNSYLVANIA LAW (25 PA CODE, CHAPTER 75). THESE RESIDUALS WOULD BE LANDFILLED OFFSITE IN AN INTERMEDIATE (RESIDUAL WASTE) LANDFILL. OFFSITE LANDFILL DISPOSAL WOULD COMPLY WITH ALL DISPOSAL ARARS. IF THE TREATMENT PLANT INCLUDES AN AIR STRIPPING UNIT, THIS UNIT WOULD BE OPERATED TO COMPLY WITH THE RELEVANT AND APPROPRIATE NAAQS (40 CFR PART 50) FOR OZONE.

AS NO ATTEMPT TO ACTIVELY CLEAN UP THE AQUIFER WOULD BE MADE UNDER ALTERNATIVE 2, THE RELEVANT AND APPROPRIATE REQUIREMENTS OF THE SDWA MCLS (40 CFR PART 141) AND THE STATE HAZARDOUS WASTE REGULATIONS REQUIREMENT (25 PA CODE, CHAPTER 75, PART 264) OF CLEANING UP THE ENTIRE AQUIFER TO BACKGROUND CONCENTRATIONS WOULD NOT BE MET. THUS, ARAR WAIVERS WOULD BE REQUIRED TO IMPLEMENT THIS ALTERNATIVE. COMPLIANCE WITH THE STATE REGULATION IS TECHNICALLY IMPRACTICABLE. GROUNDWATER MONITORING WOULD BE CONDUCTED DURING THE REMEDIATION PERIOD IN COMPLIANCE WITH 40 CFR 264.101. RESIDENCES WITH POTENTIALLY AFFECTED POTABLE WATER SUPPLY WELLS WOULD BE INCLUDED IN THE MONITORING PROGRAM TO ENSURE CONTAMINATED GROUNDWATER HAS NOT BYPASSED THE CONTAINMENT SYSTEM TO POSE AN EXPOSURE THREAT. DEED RESTRICTIONS WOULD BE PLACED ON THE CONTAMINATED AQUIFER TO RESTRICT ITS USE.

ALTERNATIVE 2 WOULD COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COSTS OF THIS ALTERNATIVE ARE $6,000,000 FOR THE CREEK DISCHARGE OPTION AND $7,720,000 FOR THE REINJECTION OPTION. ANNUAL O&M COSTS ARE ESTIMATED TO BE $1,000,000 FOR THE CREEK DISCHARGE OPTION AND $1,040,000 FOR THE REINJECTION OPTION. THE ESTIMATED PRESENT-WORTH COSTS OF THIS ALTERNATIVE ARE $21,400,000 AND $23,600,000 FOR THE CREEK DISCHARGE AND REINJECTION OPTIONS, RESPECTIVELY. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS

APPROXIMATELY 2.5 YEARS.

3. ALTERNATIVE 3: EXTRACTION (AS GT 1,000 UG/L)/PHYSICAL, CHEMICAL, (AND BIOLOGICAL) TREATMENT/DISCHARGE

A NETWORK OF GROUNDWATER COLLECTION WELLS WOULD BE ESTABLISHED THROUGHOUT THE MOST CONTAMINATED PART OF THE CONTAMINATED GROUNDWATER PLUME. THESE WELLS WOULD BE OPERATED TO REMOVE GROUNDWATER FROM THE PORTION(S) OF THE AQUIFER WITH ARSENIC CONCENTRATIONS OF 1,000 UG/L OR GREATER (I.E., THE MOST CONTAMINATED GROUNDWATER). THESE PORTION(S) OF THE CONTAMINATED AQUIFER CONTAIN APPROXIMATELY 98 PERCENT OF THE CONTAMINANT MASS. FRACTURING METHODS (E.G., HYDROFRACTURING OR BLASTING) COULD BE USED TO ENHANCE THE GROUNDWATER REMOVAL SYSTEM. AN ESTIMATED 300 GALLONS PER MINUTE (GPM) OF GROUNDWATER WOULD BE REMOVED.

THE EXTRACTED GROUNDWATER WOULD BE TREATED IN AN ONSITE TREATMENT PLANT CONSTRUCTED AND OPERATED IN COMPLIANCE WITH 40 CFR 264.600 ET SEQ. THE TREATMENT PLANT WOULD UTILIZE PHYSICAL, CHEMICAL AND POSSIBLY BIOLOGICAL PROCESSES. BENCH-SCALE STUDIES WOULD BE CONDUCTED PRIOR TO FULL-SCALE DESIGN, TO OPTIMIZE THE TREATMENT PROCESS AND DETERMINE IF BIOLOGICAL TREATMENT WOULD BE APPROPRIATE. AN EXTENSIVE AQUIFER TESTING PROGRAM WOULD ALSO BE REQUIRED PRIOR TO DESIGN OF THE TREATMENT PLANT. THE TREATED WATER WOULD EITHER BE DISCHARGED TO TULPEHOCKEN CREEK (CREEK DISCHARGE OPTION), REINJECTED INTO THE AQUIFER (REINJECTION OPTION), OR DISPOSED USING A COMBINATION OF THE TWO METHODS. TREATED WATER DISPOSAL WOULD COMPLY WITH ALL ARARS (E.G., PENNSYLVANIA WATER QUALITY STANDARDS (25 PA CODE, CHAPTER 93) AND PENNSYLVANIA WASTEWATER DISCHARGE STANDARDS (25 PA CODE, CHAPTER 92)). TREATMENT PLANT RESIDUALS WOULD BE CONSIDERED RESIDUAL WASTES UNDER PENNSYLVANIA LAW (25 PA CODE, CHAPTER 75). THESE RESIDUALS WOULD BE LANDFILLED OFF SITE IN AN INTERMEDIATE (RESIDUAL WASTE) LANDFILL. OFFSITE LANDFILL DISPOSAL WOULD COMPLY WITH ALL DISPOSAL ARARS. IF THE TREATMENT PLANT INCLUDES AN AIR STRIPPING UNIT, THIS UNIT WOULD BE OPERATED TO COMPLY WITH THE RELEVANT AND APPROPRIATE NAAQS (40 CFR PART 50) FOR OZONE.

AS NO ATTEMPT TO ACTIVELY CLEAN UP THE PORTION OF THE AQUIFER WITH ARSENIC CONCENTRATIONS LESS THAN 1,000 UG/L WOULD BE MADE UNDER ALTERNATIVE 3, THE RELEVANT AND APPROPRIATE REQUIREMENTS OF THE SDWA MCLS (40 CFR PART 141) (TABLE 1) AND THE STATE HAZARDOUS WASTE REGULATIONS (25 PA CODE, CHAPTER 75, PART 264) WOULD NOT BE MET. THUS, ARAR WAIVERS WOULD BE REQUIRED TO IMPLEMENT THIS ALTERNATIVE. GROUNDWATER MONITORING WOULD BE CONDUCTED DURING THE REMEDIATION PERIOD IN COMPLIANCE WITH 40 CFR 264.101. DEED RESTRICTIONS WOULD BE PLACED ON THE CONTAMINATED AQUIFER TO RESTRICT ITS USE.

ALTERNATIVE 3 WOULD COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COSTS OF THIS ALTERNATIVE ARE $12,900,000 FOR THE CREEK DISCHARGE OPTION AND $16,000,000 FOR THE REINJECTION OPTION. ANNUAL O&M COSTS ARE ESTIMATED TO BE $2,020,000 FOR THE CREEK DISCHARGE OPTION AND $2,070,000 FOR THE REINJECTION OPTION. THE ESTIMATED PRESENT-WORTH COSTS OF THIS ALTERNATIVE ARE $43,800,000 AND $47,600,000 FOR THE CREEK DISCHARGE AND REINJECTION OPTIONS, RESPECTIVELY. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 2.5 YEARS.

4. ALTERNATIVE 4: EXTRACTION OF ALL CONTAMINATED GROUNDWATER/PHYSICAL, CHEMICAL, (AND BIOLOGICAL) TREATMENT/DISCHARGE

THE GOAL OF ALTERNATIVE 4 IS TO RETURN THE ENTIRE CONTAMINATED AQUIFER TO ITS BENEFICIAL USE AS SOON AS IS PRACTICABLE. TO ACCOMPLISH THIS, A NETWORK OF GROUNDWATER COLLECTION WELLS WOULD BE ESTABLISHED THROUGHOUT THE CONTAMINATED GROUNDWATER PLUME. THESE WELLS WOULD BE OPERATED TO REMOVE ESSENTIALLY ALL GROUNDWATER FROM THE AQUIFER WITH CONCENTRATIONS ABOVE THE REMEDIAL ACTION LEVELS (E.G., 50 UG/L ARSENIC). FRACTURING METHODS (E.G., HYDROFRACTURING OR BLASTING) COULD BE USED TO ENHANCE THE GROUNDWATER REMOVAL SYSTEM. AN ESTIMATED 600 GALLONS PER MINUTE (GPM)

OF GROUNDWATER WOULD BE REMOVED; HOWEVER, THE SIZE OF THE TREATMENT SYSTEM AND ASSOCIATED PUMPING AND PIPING SYSTEMS WILL BE DETERMINED DUING THE REMEDIAL DESIGN PHASE OF PROJECT IMPLEMENTATION. ALTHOUGH THE FEASIBILITY STUDY AND PROPOSED PLAN SPECIFIED CERTAIN PUMPING AND TREATMENT RATES, OPTIMIZATION OF THE CHOSEN SYSTEM DURING DESIGN WILL ENSURE THAT THE MINIMUM REQUIRED PUMPING AND TREATMENT RATES WILL BE UTILIZED FOR THE REMEDIAL ACTION. ACCORDINGLY, CAPITAL AND OPERATION AND MAINTENANCE COSTS WILL ALSO BE MINIMIZED.

THE EXTRACTED GROUNDWATER WOULD BE TREATED IN AN ONSITE TREATMENT PLANT CONSTRUCTED AND OPERATED IN COMPLIANCE WITH 40 CFR 264 ET SEQ. THE TREATMENT PLANT WOULD UTILIZE PHYSICAL, CHEMICAL AND POSSIBLY BIOLOGICAL PROCESSES. BENCH-SCALE STUDIES WOULD BE CONDUCTED PRIOR TO FULL-SCALE DESIGN, TO OPTIMIZE THE TREATMENT PROCESS AND DETERMINE IF BIOLOGICAL TREATMENT WOULD BE APPROPRIATE. AN EXTENSIVE AQUIFER TESTING PROGRAM WOULD ALSO BE REQUIRED PRIOR TO DESIGN OF THE TREATMENT PLANT. THE TREATED WATER WOULD EITHER BE DISCHARGED TO TULPEHOCKEN CREEK (CREEK DISCHARGE OPTION), REINJECTED INTO THE AQUIFER (REINJECTION OPTION), OR DISPOSED USING A COMBINATION OF THE TWO METHODS. TREATED WATER DISPOSAL WOULD COMPLY WITH ALL ARARS (E.G., PENNSYLVANIA WATER QUALITY STANDARDS (25 PA CODE, CHAPTER 93) AND PENNSYLVANIA WASTEWATER DISCHARGE STANDARDS (25 PA CODE, CHAPTER 92)). TREATMENT PLANT RESIDUALS WOULD BE CONSIDERED RESIDUAL WASTES UNDER PENNSYLVANIA LAW (25 PA CODE, CHAPTER 75). THESE RESIDUALS WOULD BE LANDFILLED OFF SITE IN AN INTERMEDIATE (RESIDUAL WASTE) LANDFILL. OFFSITE LANDFILL DISPOSAL WOULD COMPLY WITH ALL DISPOSAL ARARS. IF THE TREATMENT PLANT INCLUDES AN AIR STRIPPING UNIT, THIS UNIT WOULD BE OPERATED TO COMPLY WITH THE RELEVANT AND APPROPRIATE NAAQS (40 CFR PART 50) FOR OZONE.

ALTERNATIVE 4 WOULD COMPLY WITH ALL ARARS, INCLUDING THE RELEVANT AND APPROPRIATE MCLS (40 CFR PART 141), WITH THE SOLE EXCEPTION OF THE RELEVANT AND APPROPRIATE STATE HAZARDOUS WASTE REGULATION REQUIREMENT (25 PA CODE, CHAPTER 75, PART 264) OF CLEANING UP THE ENTIRE AQUIFER TO BACKGROUND CONCENTRATIONS. COMPLIANCE WITH THIS REGULATION IS TECHNICALLY IMPRACTICABLE. A WAIVER FOR THIS ARAR WOULD BE REQUIRED TO IMPLEMENT ALTERNATIVE 4. DEED RESTRICTIONS WOULD BE PLACED ON THE CONTAMINATED AQUIFER TO RESTRICT ITS USE.

ALTERNATIVE 4 WOULD COMPLY WITH THE CERCLA PREFERENCE FOR A REMEDY THAT EMPLOYS TREATMENT TO REDUCE TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. THE ESTIMATED CAPITAL COSTS OF THIS ALTERNATIVE ARE $15,600,000 FOR THE CREEK DISCHARGE OPTION AND $19,800,000 FOR THE REINJECTION OPTION. ANNUAL O&M COSTS ARE ESTIMATED TO BE $2,390,000 FOR THE CREEK DISCHARGE OPTION AND $2,470,000 FOR THE REINJECTION OPTION. THE ESTIMATED PRESENT-WORTH COSTS OF THIS ALTERNATIVE ARE $52,300,000 AND $57,700,000 FOR THE CREEK DISCHARGE AND REINJECTION OPTIONS, RESPECTIVELY. THE ESTIMATED TIME TO IMPLEMENT THIS ALTERNATIVE IS APPROXIMATELY 2.5 YEARS.

ALTERNATIVE 5: PHASED APPROACH

(NOTE: THE FORMER OWNERS SUBMITTED AN INITIAL GROUNDWATER PROPOSAL TO EPA IN FEBRUARY 1990. THE FORMER OWNERS SUBMITTED SUPPLEMENTAL INFORMATION DESCRIBING THE FORMER OWNERS' GROUNDWATER PROPOSAL IN MORE DETAIL TO EPA ON SEPTEMBER 14, 1990. THIS ALTERNATIVE DESCRIPTION, AS WELL AS THE REST OF THIS RECORD OF DECISION, INCORPORATES THE NEW SUPPLEMENTAL INFORMATION.)

UNDER THE FORMER OWNER'S PROPOSAL (ALTERNATIVE 5), A 3-YEAR LARGE-SCALE PILOT PROGRAM WOULD BE IMPLEMENTED. DURING THE 3-YEAR PERIOD, THE PUMPING SYSTEM AND TREATMENT FACILITY WOULD BE INITIALLY OPERATED. ACCORDING TO THE FORMER OWNERS, THE OBJECTIVES OF THE PILOT PROGRAM INCLUDE PROVIDING ALL THE NECESSARY DATA TO SELECT AND DESIGN A FINAL GROUNDWATER REMEDY;

IN THE FIRST YEAR OF THE 3-YEAR PROGRAM, AN ONSITE GROUNDWATER RECOVERY WELL NETWORK AND GROUNDWATER TREATMENT SYSTEM WOULD BE DESIGNED,

INSTALLED, AND TESTED. THE RECOVERY WELL AND TREATMENT SYSTEM WOULD BE OPERATED DURING THE SECOND AND THIRD YEARS OF THE PROGRAM. ALSO, DURING THE SECOND YEAR, OFFSITE MONITORING WELLS WOULD BE INSTALLED AND TESTED. IN THE THIRD YEAR, THESE WELLS WOULD BE MONITORED.

THE RECOVERY WELL AND TREATMENT SYSTEM WOULD BE OPERATED AT APPROXIMATELY 120 GPM. THE SYSTEM OPERATION WOULD ONLY PUMP AND TREAT THE MOST CONTAMINATED GROUNDWATER. THE EXTRACTED GROUNDWATER WOULD BE PHYSICALLY AND CHEMICALLY TREATED TO REMOVE CONTAMINANTS. PORTIONS OF THE GROUNDWATER WOULD BE REINJECTED INTO THE AQUIFER OR USED FOR SOIL FLUSHING, WHILE THE REMAINDER WOULD BE DISCHARGED TO TULPEHOCKEN CREEK. UP TO 40 WELLS WOULD BE INSTALLED TO ESTABLISH THE OFFSITE MONITORING WELL SYSTEM.

OTHER THAN MONITORING, OFFSITE GROUNDWATER WOULD BE UNADDRESSED; THE CONTAMINANT PLUME WOULD CONTINUE TO GROW DURING THE 3-YEAR PERIOD. THE RELEVANT AND APPROPRIATE GROUNDWATER QUALITY ARARS (MCLS (40 CFR PART 141)) (TABLE 1), AND THE STATE HAZARDOUS WASTE REGULATION REQUIREMENT (25 PA CODE, CHAPTER 75, PART 264) OF CLEANING UP THE ENTIRE AQUIFER TO BACKGROUND CONCENTRATIONS WOULD NOT BE MET DURING THE PILOT PROGRAM. THUS, ARAR WAIVERS WOULD BE REQUIRED TO IMPLEMENT THIS ALTERNATIVE. DEED RESTRICTIONS WOULD BE PLACED ON THE CONTAMINATED AQUIFER TO RESTRICT ITS USE DURING THE PILOT PROGRAM.

ONCE THE 3-YEAR PILOT PROGRAM IS COMPLETED, THE FINAL GROUNDWATER REMEDY WOULD BE SELECTED AND THE LONG-TERM (PHASE II) GROUNDWATER REMEDIATION PROGRAM IMPLEMENTED. ACCORDING TO THE FORMER OWNERS, THE OBJECTIVES OF THE LONG-TERM PROGRAM ARE TO PROVIDE FOR REMOVAL AND TREATMENT OF ARSENIC AND OTHER CONTAMINANTS FROM GROUNDWATER THAT HAS BECOME CONTAMINATED; TO PROTECT HUMAN HEALTH BY PREVENTING EXPOSURE TO GROUNDWATER ABOVE MCLS; TO SERVE AS A COLLECTOR SYSTEM FOR SOIL FLUSHING LEACHATE; AND TO PROVIDE A SOURCE OF WATER FOR THE SOIL FLUSHING PROGRAM. SPECIFIC GROUNDWATER REMEDIATION OBJECTIVES (E.G, RESTORE CONTAMINANT CONCENTRATIONS IN THE ENTIRE AREA OF ATTAINMENT TO MCLS OR 1 X (10-6) EXCESS LIFETIME CANCER RISK-BASED LEVELS) WERE NOT SPECIFIED BY THE FORMER OWNERS.

THE FORMER OWNERS ANTICIPATE THAT THE PHASE II PROGRAM WOULD BE AN EXPANSION OF THE PHASE I PROGRAM, WITH A MORE EXTENSIVE NETWORK OF PUMPING WELLS. A LONG-TERM GROUNDWATER PUMPING RATE OF 300 TO 400 GALLONS PER MINUTE IS EXPECTED, WITH THE ACTUAL RATE DETERMINED BASED UPON PHASE I DATA. THE SYSTEM WOULD PUMP AND TREAT GROUNDWATER ONLY FROM THE MOST HIGHLY CONTAMINATED (UNDEFINED) PART OF THE PLUME. IT IS UNCLEAR HOW LONG THE LONG-TERM PUMP-AND-TREAT SYSTEM WOULD OPERATE. IN ONE PLACE THE FORMER OWNERS STATED THE SYSTEM WOULD OPERATE UP TO 27 YEARS. IN ANOTHER PLACE THEY STATED IT WOULD BE OPERATED UNTIL GROUNDWATER REMEDIATION GOALS WERE ACHIEVED.

IF GROUNDWATER IS EXTRACTED FROM ONLY THE MOST CONTAMINATED PORTION OF THE PLUME (AND IS NOT EXTRACTED FROM THE ENTIRE CONTAMINANT PLUME), ALTERNATIVE 5 WOULD NOT COMPLY WITH THE GROUNDWATER RELEVANT AND APPROPRIATE REQUIREMENT OF 50 UG/L ARSENIC FOR THE ENTIRE GROUNDWATER PLUME AREA OF ATTAINMENT, AND POSSIBLY NOT WITH THE PERTINENT RELEVANT AND APPROPRIATE MCLS FOR ORGANIC CHEMICALS. THE PORTION OF THE AQUIFER UNADDRESSED BY THE EXTRACTION SYSTEM THAT CONTAINED CONTAMINANT CONCENTRATIONS IN EXCESS OF MCLS WOULD BE EXPECTED TO GROW OVER TIME.

THE FORMER OWNERS ESTIMATE THE TOTAL COST OF THEIR PILOT-SCALE PROGRAM, INCLUDING TWO YEARS OF O&M, AT $5,500,000. THE FORMER OWNERS ESTIMATE THAT THE PRESENT WORTH COST OF THE LONG-TERM GROUNDWATER PUMP-AND-TREAT PROGRAM, INCLUDING 27 YEARS OF O&M, AT $34,000,000. THUS THE FORMER OWNERS' ESTIMATED TOTAL COST OF ALTERNATIVE 5 IS $39,500,000.

6. COMPARATIVE ANALYSIS OF ALTERNATIVES - GROUNDWATER

THE FIVE GROUNDWATER REMEDIAL ACTION ALTERNATIVES DESCRIBED ABOVE WERE EVALUATED USING THE NINE CRITERIA IN THE NCP. THE EVALUATIONS ARE AS FOLLOWS:

OVERALL PROTECTION

ALTERNATIVE 4 WOULD PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT BY COLLECTING AND TREATING THE ENTIRE CONTAMINATED GROUNDWATER PLUME, ALTHOUGH THE REMEDIATION TIME MAY WELL EXCEED 30 YEARS. ALTERNATIVE 2 WOULD BE LESS PROTECTIVE, SINCE IT IS HEAVILY DEPENDENT ON DEED RESTRICTIONS AND MONITORING TO PREVENT EXPOSURE. UNDER ALTERNATIVE 2, OFFSITE GROUNDWATER QUALITY WOULD DETERIORATE IN THE NEAR-TERM. IF THE PLUME CONTAINMENT (CAPTURE) SYSTEM IS INCOMPLETE, INCREASING AMOUNTS OF CONTAMINANTS WOULD ESCAPE THE CONTAINMENT SYSTEM OVER TIME.

ALTERNATIVES 3 AND 5 WOULD BE LESS PROTECTIVE THAN ALTERNATIVE 4, SINCE NOT ALL OF THE CONTAMINATED GROUNDWATER WOULD BE EXTRACTED. THE GROUNDWATER CONTAMINANT PLUME WOULD BE ALLOWED TO GROW OVER TIME. UNLIKE ALTERNATIVE 2, ALTERNATIVES 3 AND 5 WOULD REMOVE THE MOST HEAVILY CONTAMINATED GROUNDWATER FROM THE AQUIFER. HOWEVER, ALTERNATIVE 2 WOULD KEEP THE CONTAMINANT PLUME FROM GROWING.

SINCE THE REMEDIAL ACTION OBJECTIVES (CLEANUP LEVELS) UNDER ALTERNATIVE 5 WERE NOT SPECIFIED, THEY CAN NOT BE COMPARED WITH THOSE FOR ALTERNATIVES 2-4. FOR GROUNDWATER-BASED SOIL CLEANUP LEVELS, THE FORMER OWNERS ADVOCATE THE USE OF A 1 X (10-4) EXCESS LIFETIME CANCER RISK-BASED CLEANUP LEVEL FOR CARCINOGENS AND A HAZARD QUOTIENT OF 1 FOR NON-CARCINOGENS IN THE ABSENCE OF MCLS. EPA HAS DETERMINED THAT, IN THE ABSENCE OF MCLS, A 1 X (10-6) EXCESS LIFETIME CANCER RISK-BASED STANDARD IS APPROPRIATE FOR GROUNDWATER. GIVEN THE SITE-SPECIFIC CONDITIONS, EPA HAS DETERMINED THAT CLEANING UP GROUNDWATER AT THE WHITMOYER LABORATORIES SITE TO A 1 X (10-4) EXCESS LIFETIME CANCER RISK-BASED STANDARD IS NOT PROTECTIVE OF HUMAN HEALTH.

THE "NO ACTION" ALTERNATIVE IS NOT PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT; THEREFORE, IT IS NOT CONSIDERED FURTHER IN THIS ANALYSIS AS AN OPTION FOR THE GROUNDWATER.

REGULATORY COMPLIANCE

ALTERNATIVE 4 WOULD MEET ALL OF ITS APPLICABLE AND RELEVANT AND APPROPRIATE REQUIREMENTS, INCLUDING THE RELEVANT AND APPROPRIATE SDWA MCLS (40 CFR PART 141) (TABLE 1), WITH THE SOLE EXCEPTION OF THE STATE RELEVANT AND APPROPRIATE REQUIREMENT OF CLEANING UP TO BACKGROUND (25 PA CODE, CHAPTER 75, PART 264). SINCE COMPLIANCE WITH THIS ARAR IS TECHNICALLY IMPRACTICABLE, AN ARAR WAIVER IS JUSTIFIED. UNDER ALTERNATIVES 2 AND 5, THE ENTIRE CONTAMINATED GROUNDWATER PLUME WOULD NOT COMPLY WITH THE RELEVANT AND APPROPRIATE SDWA MCLS, AS WELL AS THE STATE REQUIREMENT OF CLEANING UP TO BACKGROUND. UNDER ALTERNATIVE 3, THE UNREMEDIATED PORTION OF THE CONTAMINATED GROUNDWATER PLUME CONTAINING LESS THAN 1,000 UG/L WOULD NOT COMPLY WITH THE RELEVANT AND APPROPRIATE SDWA MCLS, AND THE ENTIRE PLUME WOULD NOT COMPLY WITH THE STATE BACKGROUND REQUIREMENT. THUS, A WAIVER OF THE SDWA MCL ARAR WOULD BE REQUIRED TO IMPLEMENT ALL OF THE ALTERNATIVES EXCEPT ALTERNATIVE 4; AND A WAIVER OF THE STATE BACKGROUND REQUIREMENT WOULD BE REQUIRED FOR ALL OF THE ALTERNATIVES. A WAIVER OF THE STATE BACKGROUND REQUIREMENT IS JUSTIFIABLE BECAUSE OF TECHNICAL IMPRACTICABILITY. ALL OF THE ALTERNATIVES WOULD CONFORM WITH THE CERCLA PREFERENCE FOR TREATMENT.

LONG-TERM EFFECTIVENESS AND PERMANENCE

IF ALTERNATIVE 4 PROVED TO BE TECHNICALLY PRACTICABLE, RISKS FROM THE GROUNDWATER WOULD BE VIRTUALLY ELIMINATED, ALTHOUGH THE REMEDIATION TIMEFRAME MAY EXCEED 30 YEARS. PROPER DISPOSAL OF TREATMENT RESIDUALS WOULD PREVENT FUTURE RISKS. ALTERNATIVE 2 WOULD BE LESS EFFECTIVE IN THE SAME TIMEFRAME AS ALTERNATIVE 4, AS MUCH LESS CONTAMINATION WOULD BE REMOVED FROM THE AQUIFER, AND CONTAMINATION WOULD CONTINUE TO MIGRATE OFF SITE AND DETERIORATE OFFSITE GROUNDWATER QUALITY. CONTINUED EXPANSION OF THE GROUNDWATER PLUME WOULD BE CONTROLLED BY THE GROUNDWATER EXTRACTION SYSTEM. UNDER ALTERNATIVE 3, MIGRATION OF THE

MOST CONTAMINATED PORTION OF THE GROUNDWATER PLUME WOULD BE CONTROLLED BY THE EXTRACTION SYSTEM. THIS PORTION WOULD BE ACTIVELY REMEDIATED. HOWEVER, THE LESS CONTAMINATED PORTION OF THE PLUME WOULD BE ALLOWED TO EXPAND OVER TIME AND POSE FUTURE HEALTH RISKS.

SINCE A FINAL REMEDY WOULD NOT BE SELECTED AT THIS TIME UNDER ALTERNATIVE 5, THE LONG-TERM EFFECTIVENESS OF THIS ALTERNATIVE CAN NOT BE COMPLETELY DISCUSSED. THE PILOT-SCALE PROGRAM MAKING UP ALTERNATIVE 5 IS INTENDED TO EVALUATE THE POTENTIAL FOR BOTH ACTIVE REMEDIATION AND CONTAINMENT OF THE CONTAMINATED GROUNDWATER. THE FORMER OWNERS PROPOSE TO ONLY PUMP AND TREAT GROUNDWATER FROM THE MOST CONTAMINATED PORTION OF THE GROUNDWATER PLUME. APPARENTLY THE LESS CONTAMINATED PORTION OF THE PLUME WOULD BE ALLOWED TO EXPAND OVER TIME AND CONTINUE TO POSE FUTURE HEALTH RISKS.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME OF THE CONTAMINANTS THROUGH TREATMENT.

ALTERNATIVE 4 WOULD REDUCE THE TOXICITY, MOBILITY, AND VOLUME OF THE CONTAMINATION PRESENT IN THE GROUNDWATER. THE CONTAMINANT MOBILITY WOULD BE REDUCED BY THE COLLECTION SYSTEM AND TREATMENT OF THE EXTRACTED CONTAMINANTS TO DESTROY THE ORGANIC CONTAMINANTS AND IMMOBILIZE THE ARSENIC IN A RELATIVELY INSOLUBLE CHEMICAL PRECIPITATE. CONTAMINANT TOXICITY WOULD BE REDUCED BY ORGANIC DESTRUCTION. THE VOLUME OF CONTAMINATED GROUNDWATER WOULD BE SIGNIFICANTLY REDUCED OVER TIME.

UNDER ALTERNATIVE 2, CONTAMINANT MOBILITY WOULD BE REDUCED SOMEWHAT BY THE CONTAINMENT SYSTEM AND THE TREATMENT OF THE EXTRACTED CONTAMINANTS. HOWEVER, THE EXTRACTION SYSTEM WOULD BE LESS AGGRESSIVE THAN THE ALTERNATIVE 4 SYSTEM, AND SIGNIFICANTLY LESS QUANTITIES OF CONTAMINANTS WOULD BE REMOVED FOR TREATMENT IN EQUIVALENT TIMEFRAMES. CONTAMINANT TOXICITY WOULD BE REDUCED SOMEWHAT BY THE ORGANIC DESTRUCTION. THERE WOULD BE NO REDUCTION IN CONTAMINATED GROUNDWATER VOLUME, SINCE ACTIVE REMEDIATION OF THE GROUNDWATER PLUME WOULD NOT BE ATTEMPTED.

UNDER ALTERNATIVE 3, APPROXIMATELY 50 PERCENT OF THE GROUNDWATER PLUME CONTAINING APPROXIMATELY 98 PERCENT OF THE GROUNDWATER CONTAMINANTS WOULD BE ACTIVELY REMEDIATED. HOWEVER, THE VOLUME OF CONTAMINATED GROUNDWATER WOULD INCREASE OVER TIME AS THE UNADDRESSED GROUNDWATER PLUME EXPANDS.

THE FORMER OWNERS DO NOT SPECIFY WHAT PORTION OF THE CONTAMINATED AQUIFER WOULD BE ACTIVELY REMEDIATED UNDER THEIR PROGRAM (ALTERNATIVE 5). AN ESTIMATED 300 TO 400 GALLONS PER MINUTE WOULD BE WITHDRAWN, SIGNIFICANTLY LESS THAN THE ESTIMATED 600 GALLONS PER MINUTE UNDER ALTERNATIVE 4. THE FORMER OWNERS ALSO STATED THAT ONLY THE MOST HIGHLY CONTAMINATED PART OF THE PLUME WOULD BE PUMPED AND TREATED. APPARENTLY THE LESS CONTAMINATED PART OF THE PLUME WOULD BE UNADDRESSED BY THE PUMP-AND-TREAT PROGRAM. IF THIS IS THE CASE, THE VOLUME OF CONTAMINATED GROUNDWATER WOULD INCREASE OVER TIME AS THE UNADDRESSED PLUME EXPANDS.

SHORT-TERM EFFECTIVENESS

ALTERNATIVE 4 WOULD HAVE A HIGH DEGREE OF SHORT-TERM EFFECTIVENESS. COMPLETE REMEDIATION OF THE GROUNDWATER MAY TAKE MORE THAN 30 YEARS, HOWEVER. ALTERNATIVE 2 WOULD BE LESS EFFECTIVE IN THE SHORT-TERM, AS CONTAMINANT CONCENTRATIONS IN THE OFFSITE GROUNDWATER WOULD BE ALLOWED TO INCREASE OVER TIME. IF THE PLUME CAPTURE SYSTEM IS INCOMPLETE (WHICH IS A SIGNIFICANT POSSIBILITY CONSIDERING THE COMPLEX HYDROGEOLOGIC SETTING OF THE SITE), INCREASING AMOUNTS OF CONTAMINANTS WOULD ESCAPE THE CONTAINMENT SYSTEM OVER TIME. DISCHARGE OF GROUNDWATER CONTAMINANTS TO SURFACE WATER COULD ALSO INCREASE OVER TIME. THE REMEDIATION TIMEFRAME WOULD BE SIGNIFICANTLY LONGER THAN FOR ALTERNATIVE 4.

BECAUSE ALTERNATIVES 3 AND 5 ALLOW THE CONTAMINANT PLUME TO INCREASE OVER TIME, THESE ALTERNATIVES ARE LESS RELIABLE THAN ALTERNATIVE 4. THE REMEDIATION TIMEFRAME FOR ALTERNATIVE 3 IS COMPARABLE TO THE ALTERNATIVE 4 TIMEFRAME AND LESS THAN THE TIMEFRAME FOR ALTERNATIVE 2. BECAUSE

ALTERNATIVE 5 DOES NOT SPECIFY THE FINAL GROUNDWATER REMEDY, ITS REMEDIATION TIMEFRAME CAN NOT BE DISCUSSED.

IMPLEMENTABILITY

THERE IS A CONCERN WHETHER ACHIEVING THE GROUNDWATER CLEANUP GOALS IS TECHNICALLY FEASIBLE. THE PROPOSED GROUNDWATER TREATMENT TECHNOLOGIES FOR ALL OF THE ALTERNATIVES ARE HIGHLY RELIABLE. THE VARIOUS ALTERNATIVES HAVE FEW ASSOCIATED ADMINISTRATIVE DIFFICULTIES THAT COULD DELAY IMPLEMENTATION. PERMITS WOULD BE REQUIRED FOR THE OFFSITE DISPOSAL OF THE TREATMENT RESIDUALS. THE EQUIPMENT, SPECIALISTS, AND TREATMENT/DISPOSAL FACILITIES NECESSARY TO IMPLEMENT THE ALTERNATIVES ARE READILY AVAILABLE. BENCH-SCALE TREATMENT OPTIMIZATION STUDIES WOULD BE REQUIRED PRIOR TO IMPLEMENTATION OF ALL OF THE ALTERNATIVES TO OPTIMIZE REAGENT DOSAGES AND OPERATING CONDITIONS. ADDITIONALLY, AN AQUIFER TESTING PROGRAM WOULD BE REQUIRED FOR ALL OF THE ALTERNATIVES TO PERMIT MORE ACCURATE ESTIMATION OF THE REQUIRED TREATMENT PLANT CAPACITY. FOR ALL OF THE ALTERNATIVES, MONITORING OF AIR, GROUNDWATER, SURFACE WATER, AND THE TREATMENT RESIDUALS DURING IMPLEMENTATION WOULD BE REQUIRED. GROUNDWATER MONITORING WOULD BE ESPECIALLY IMPORTANT FOR THE PLUME CONTAINMENT OPTION (ALTERNATIVE 2), SINCE HEAVILY GROUNDWATER COULD ESCAPE THE CONTAINMENT SYSTEM AND FURTHER CONTAMINATE GROUNDWATER.

COST

THE ESTIMATED PRESENT-WORTH COSTS OF ALTERNATIVE 4 FOR THE GROUNDWATER ARE $52,300,000 AND $57,700,000 FOR THE CREEK DISCHARGE AND REINJECTION OPTIONS, RESPECTIVELY. ALTERNATIVE 4 IS THE HIGHEST COST ALTERNATIVE. THE LOWEST-COST ALTERNATIVE IS ALTERNATIVE 2 AT $21,400,000 (CREEK DISCHARGE OPTION). THE OTHER ALTERNATIVE COSTS ARE PRESENTED IN THE ALTERNATIVE DESCRIPTION SECTIONS.

STATE ACCEPTANCE

THE COMMONWEALTH OF PENNSYLVANIA SUPPORTS THE SELECTION OF ALTERNATIVE 4, WITH THE CONTINGENT REMEDY OF ALTERNATIVE 2.

COMMUNITY ACCEPTANCE

A PUBLIC MEETING ON THE PROPOSED PLAN WAS HELD AUGUST 1 IN LEBANON COUNTY, PENNSYLVANIA. COMMENTS RECEIVED FROM THE PUBLIC DURING THE COMMENT PERIOD ARE REFERENCED IN THE RESPONSIVENESS SUMMARY ATTACHED TO THIS RECORD OF DECISION.

#SR
VIII. THE SELECTED REMEDY

BASED UPON CONSIDERATION OF INFORMATION AVAILABLE FOR OPERABLE UNIT THREE OF THE WHITMOYER LABORATORIES SITE, INCLUDING THE DOCUMENTS AVAILABLE IN THE ADMINISTRATIVE RECORD, AN EVALUATION OF THE RISKS CURRENTLY POSED BY THE SITE, THE REQUIREMENTS OF CERCLA, THE DETAILED EVALUATION OF ALTERNATIVES, AND COMMUNITY INPUT; BOTH EPA HAS SELECTED THE FOLLOWING ALTERNATIVES AS THE REMEDY TO BE IMPLEMENTED FOR THE OPERABLE UNIT.

A. SOILS/SEDIMENTS

ALTERNATIVE 6 - IRON-BASED FIXATION OF THE "PRINCIPAL THREAT" SOILS/SEDIMENTS; BIOLOGICAL TREATMENT OF THE SOILS/SEDIMENTS WHICH CONTAIN ORGANIC CHEMICALS IN CONCENTRATIONS GREATER THAN THE "PRINCIPAL THREAT" ORGANIC ACTION LEVELS; ONSITE CONSOLIDATION OF THE SOILS WHICH POSE A THREAT TO GROUNDWATER BUT CONTAIN CONTAMINANT CONCENTRATIONS LESS THAN THE "PRINCIPAL THREAT" ACTION LEVELS, FOLLOWED BY CAPPING WITH IMPERMEABLE MATERIALS; AND SOIL CAPPING OF THE LIGHTLY CONTAMINATED SURFACE SOILS. THE "PRINCIPAL THREAT" SOILS/SEDIMENTS WOULD BE TREATED TO COMPLY WITH RCRA LAND DISPOSAL RESTRICTIONS; TO REDUCE THE ARSENIC

MOBILITY, AS MEASURED BY THE TCLP, BY AT LEAST 90 PERCENT; AND TO REDUCE THE ORGANIC CONTAMINANT CONCENTRATIONS TO THE "PRINCIPAL THREAT" SOIL ACTION LEVELS (BIOLOGICALLY TREATED SOILS ONLY), PRIOR TO BEING LANDFILLED AT AN OFFSITE DISPOSAL FACILITY.

B. GROUNDWATER

ALTERNATIVE 4 - EXTRACTION OF ALL CONTAMINATED GROUNDWATER, FOLLOWED BY PHYSICAL, CHEMICAL AND POSSIBLY BIOLOGICAL TREATMENT AND DISCHARGE OF THE TREATED WATER TO REINJECTION WELLS AND/OR TULPEHOCKEN CREEK. BASED ON CURRENT INFORMATION, THIS ALTERNATIVE APPEARS TO PROVIDE THE BEST BALANCE OF TRADE-OFFS AMONG THE GROUNDWATER ALTERNATIVES WITH RESPECT TO NINE CRITERIA THAT EPA USES TO EVALUATE ALTERNATIVES.

THERE IS A MODERATE DEGREE OF UNCERTAINTY OVER WHETHER THE SELECTED REMEDY WILL BE ABLE TO MEET THE GROUNDWATER HEALTH-BASED CLEANUP LEVELS IDENTIFIED BY THE EPA. IT MAY POTENTIALLY PROVE TECHNICALLY IMPRACTICABLE TO ACHIEVE THE HEALTH-BASED GROUNDWATER CLEANUP GOALS UNDER THE SELECTED REMEDY FOR THE GROUNDWATER. IT WILL BE DIFFICULT TO PREDICT THE ULTIMATE CONCENTRATIONS TO WHICH CONTAMINANTS IN THE GROUNDWATER MAY BE REDUCED UNTIL THE ALTERNATIVE 4 EXTRACTION SYSTEM HAS BEEN OPERATING FOR SOME PERIOD OF TIME. IF INFORMATION EMERGES FROM THE OPERATION OF THE ALTERNATIVE 4 EXTRACTION SYSTEM THAT STRONGLY SUGGESTS THAT IT IS TECHNICALLY IMPRACTICABLE TO ACHIEVE THE CLEANUP GOALS THROUGHOUT THE CONTAMINATED GROUNDWATER PLUME BECAUSE OF AN OBSERVED "LEVELING-OFF" OF CONTAMINANT CONCENTRATIONS, THE EPA, IN CONSULTATION WITH THE COMMONWEALTH OF PENNSYLVANIA, INTENDS TO SELECT THE CONTINGENT REMEDY OF ALTERNATIVE 2 IN THOSE AREAS WHERE THE CLEANUP GOALS WILL NOT BE MET. ALTERNATIVE 2 WOULD INVOLVE EXTRACTING GROUNDWATER FROM THE PERIMETER OF THE TARGETED GROUNDWATER PLUME ONLY IN SUFFICIENT QUANTITIES TO KEEP THE PLUME FROM SPREADING. IN OTHER WORDS, ACTIVE REMEDIATION WOULD NOT BE ATTEMPTED.

THE ESTIMATED PRESENT-VALUE COST OF THIS SELECTED REMEDY IS $77,300,000; AS FOLLOWS:

MEDIUM	PRESENT-VALUE COST
SOILS/SEDIMENTS	$25,000,000
GROUNDWATER	$52,300,000
TOTAL COST	$77,300,000

THE MAJOR COMPONENTS OF THE SELECTED REMEDIAL ACTION ARE AS FOLLOWS:

* EXCAVATION OF ALL MODERATELY CONTAMINATED SOILS/SEDIMENTS FROM OFFSITE AND SATURATED ONSITE LOCATIONS, AND ALL HEAVILY CONTAMINATED SOILS (ESTIMATED VOLUME = 116,000 CUBIC YARDS (CY)).

* DEMOLITION OF BUILDINGS 4, 9, 11, AND 14.

* BACKFILLING OF THE EXCAVATED AREAS WITH CLEAN FILL OR LIGHTLY CONTAMINATED SOIL.

* ONSITE FIXATION OF THE APPROXIMATELY 61,000 CY OF HEAVILY CONTAMINATED SOILS/SEDIMENTS USING AN IRON-BASED OR OTHER SIMILAR FIXATION PROCESS THAT PROVIDES EQUIVALENT PROTECTION.

* BIOLOGICAL TREATMENT OF THE APPROXIMATELY 5,600 CY OF SOILS WITH ORGANIC CHEMICAL CONCENTRATIONS ABOVE THE HEAVILY CONTAMINATED SOIL ACTION LEVELS EITHER PRIOR TO OR FOLLOWING THE FIXATION STEP.

* CONSOLIDATION OF THE MODERATELY CONTAMINATED

SOILS/SEDIMENTS ON SITE ABOVE THE GROUNDWATER TABLE.

* CAPPING OF THE APPROXIMATELY 39,000 CY OF MODERATELY CONTAMINATED SOILS/SEDIMENTS HAVING CONTAMINANT CONCENTRATIONS ABOVE GROUNDWATER-BASED UNSATURATED SOIL CLEANUP TARGETS WITH LOW-PERMEABILITY MATERIALS.

* SOIL CAPPING OF ALL SOILS/SEDIMENTS REMAINING ON THE SURFACE FOLLOWING THE EXCAVATION AND CONSOLIDATION STEPS THAT ARE NOT CAPPED WITH LOW-PERMEABILITY MATERIALS AND CONTAIN GREATER THAN 21 MG/KG ARSENIC; AND OTHER DISTURBED AREAS AS NEEDED.

* GRADING AND REVEGETATION OF ALL AREAS AFFECTED BY THE SOIL/SEDIMENT REMEDIATION.

* FOLLOWING THE SOILS/SEDIMENTS REMEDIATION, PLACEMENT OF DEED RESTRICTIONS ON AREAS WITH REMAINING CONTAMINATION.

* AGGRESSIVE EXTRACTION OF ALL GROUNDWATER FROM THE AQUIFER BENEATH THE SITE WITH CONCENTRATIONS ABOVE HEALTH-BASED LEVELS (E.G., 50 UG/L ARSENIC) UNTIL THE MAXIMUM GROUNDWATER CONTAMINANT CONCENTRATIONS ARE ALL LESS THAN HEALTH-BASED LEVELS.

* TREATMENT OF THE EXTRACTED GROUNDWATER IN AN ONSITE TREATMENT PLANT, UTILIZING PHYSICAL, CHEMICAL AND POSSIBLY BIOLOGICAL PROCESSES. THE SIZE OF THE TREATMENT SYSTEM AND ASSOCIATED PUMPING AND PIPING SYSTEMS WILL BE DETERMINED DURING THE REMEDIAL DESIGN PHASE OF PROJECT IMPLEMENTATION. ALTHOUGH THE FEASIBILITY STUDY AND PROPOSED PLAN SPECIFIED CERTAIN PUMPING AND TREATMENT RATES, OPTIMIZATION OF THE CHOSEN SYSTEM DURING DESIGN WILL ENSURE THAT THE MINIMUM REQUIRED PUMPING AND TREATMENT RATES WILL BE UTILIZED FOR THE REMEDIAL ACTION. ACCORDINGLY, CAPITAL AND OPERATION AND MAINTENANCE COSTS WILL ALSO BE MINIMIZED.

* DISPOSAL OF THE TREATED WATER BY EITHER DISCHARGING IT TO TULPEHOCKEN CREEK, REINJECTING IT INTO THE AQUIFER, OR A COMBINATION OF THE TWO METHODS.

* SALVAGING NONHAZARDOUS DEMOLITION DEBRIS, AS FEASIBLE.

* DISPOSAL OF THE FOLLOWING IN OFFSITE LANDFILL(S) IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS: THE TREATED SOILS; THE GROUNDWATER TREATMENT RESIDUALS; AND THE DEMOLITION DEBRIS THAT IS NOT SALVAGED.

THE SELECTED REMEDY IS THE LAST OF SEVERAL PHASES IN THE LONG-TERM REMEDIATION OF THIS SITE AND WILL BE CONSISTENT WITH PREVIOUSLY SELECTED SITE REMEDIES.

THE CONTINGENT REMEDY IS SIMILAR TO THE SELECTED REMEDY, WITH THE EXCEPTION THAT GROUNDWATER WOULD ONLY BE EXTRACTED FROM THE PERIMETER OF THE NON-ATTAINMENT AREA IN SUFFICIENT QUANTITIES TO KEEP THIS AREA FROM GROWING. ADDITIONALLY, CONTACT WITH CONTAMINATED GROUNDWATER WOULD BE RESTRICTED THROUGH THE USE OF DEED RESTRICTIONS AND AN EXTENSIVE GROUNDWATER MONITORING PROGRAM.

THESE ACTIONS WILL SIGNIFICANTLY REDUCE OR ELIMINATE THE ACTUAL AND POTENTIAL THREATS TO HUMAN HEALTH AND THE ENVIRONMENT POSED BY THE OU THREE MATERIALS, AND ARE CONSISTENT WITH EPA'S STRATEGY FOR REMEDIATION OF THE SITE.

#SD
IX. STATUTORY DETERMINATIONS

UNDER ITS LEGAL AUTHORITIES, EPA'S PRIMARY RESPONSIBILITY AT SUPERFUND SITES IS TO UNDERTAKE REMEDIAL ACTIONS THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, SECTION 121 OF CERCLA ESTABLISHES SEVERAL OTHER STATUTORY REQUIREMENTS AND PREFERENCES. THESE SPECIFY THAT WHEN COMPLETE, THE SELECTED REMEDIAL ACTION (AND THE CONTINGENT REMEDIAL ACTION) FOR THIS SITE MUST COMPLY WITH APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL STANDARDS ESTABLISHED UNDER FEDERAL AND STATE ENVIRONMENTAL LAWS UNLESS A STATUTORY WAIVER IS GRANTED. THE SELECTED REMEDY AND CONTINGENT REMEDY ALSO MUST BE COST-EFFECTIVE AND UTILIZE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. FINALLY, THE STATUTE INCLUDES A PREFERENCE FOR REMEDIES THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF HAZARDOUS WASTES. THE FOLLOWING SECTIONS DISCUSS HOW THE SELECTED REMEDY AND CONTINGENT REMEDY FOR THIS SITE MEET THESE STATUTORY REQUIREMENTS.

A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

BASED ON THE RISK ASSESSMENT DEVELOPED FOR OU THREE MATERIALS, ACTUAL OR POTENTIAL EXPOSURE PATHWAYS INCLUDE GROUNDWATER CONSUMPTION, DERMAL CONTACT, ACCIDENTAL INGESTION, AND INHALATION. THE SELECTED REMEDY ADDRESSES THESE RISKS (PROTECTS HUMAN HEALTH AND THE ENVIRONMENT) BY REDUCING THE MOBILITY OF THE ARSENIC IN THE HEAVILY CONTAMINATED SOILS USING AN IRON-BASED OR OTHER SIMILAR FIXATION PROCESS; DESTROYING THE ORGANIC CONTAMINATION IN THE SOILS/SEDIMENTS THAT ARE HEAVILY CONTAMINATED WITH ORGANIC CHEMICALS BY BIOLOGICAL TREATMENT; CONSOLIDATING AND IMPERMEABLY CAPPING UNTREATED SOILS WHICH POSE A THREAT TO GROUNDWATER; SOIL CAPPING SURFACE SOILS WHICH POSE ONLY A DIRECT CONTACT THREAT; SALVAGING NONHAZARDOUS DEMOLITION DEBRIS, AS FEASIBLE; AGGRESSIVELY COLLECTING AND TREATING ALL CONTAMINATED GROUNDWATER (I.E., RESTORING THE CONTAMINATED AQUIFER); AND DISPOSAL OF THE TREATED SOILS/SEDIMENTS, THE GROUNDWATER TREATMENT RESIDUALS, AND THE UNTREATED (NONHAZARDOUS) DEMOLITION DEBRIS THAT IS NOT SALVAGED IN OFFSITE LANDFILL(S) TO FURTHER REDUCE CONTAMINANT MOBILITY AND ACCESS TO THESE MATERIALS.

THE SELECTED REMEDY WILL NOT POSE ANY UNACCEPTABLE SHORT-TERM RISKS OR CROSS-MEDIA IMPACTS TO THE SITE, THE WORKERS, OR THE COMMUNITY. THERE WILL BE SOME LONG-TERM RISKS ASSOCIATED WITH LEAVING MODERATELY AND LIGHTLY CONTAMINATED SOILS/SEDIMENTS AT THE SITE. HOWEVER, THESE MATERIALS WILL BE CAPPED, AND ACCESS TO THESE MATERIALS WILL BE RESTRICTED BY PLACING DEED RESTRICTIONS ON AREAS WHERE THEY ARE PRESENT FOLLOWING THE REMEDIATION. SINCE METALS CANNOT BE DESTROYED, THERE WILL BE SOME LONG-TERM RISK ASSOCIATED WITH THE HEAVY METAL (PRIMARILY ARSENIC) CONTENT OF THE HEAVILY CONTAMINATED SOILS/SEDIMENTS. HOWEVER, THESE SOILS/SEDIMENTS WILL BE TREATED PRIOR TO DISPOSAL TO REDUCE THE MOBILITY OF THE HEAVY METALS, AND THE TREATED SOILS/SEDIMENTS WILL BE PLACED INTO AN OFFSITE LANDFILL FOR PROPER LONG-TERM MANAGEMENT.

THE CONTINGENT REMEDY ADDRESSES THE RISKS POSED BY THE CONTAMINATED SOILS/SEDIMENTS IN THE SAME MANNER AS THE SELECTED REMEDY. HOWEVER, FOR THE GROUNDWATER MEDIUM, ACTIVE RESTORATION OF THE AQUIFER WOULD NOT OCCUR; ONLY MEASURES INTENDED TO KEEP THE CONTAMINANT PLUME FROM EXPANDING WOULD OCCUR. THE CONTINGENT REMEDY WOULD PROTECT HUMAN HEALTH AND THE ENVIRONMENT BY HALTING PLUME EXPANSION AND RESTRICTING CONTACT WITH CONTAMINATED GROUNDWATER THROUGH THE USE OF DEED RESTRICTIONS AND GROUNDWATER MONITORING.

B. ATTAINMENT OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

THE SELECTED REMEDY WILL ATTAIN ALL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE SITE, THE OU THREE MATERIALS, AND THE ACTIONS THAT WILL BE IMPLEMENTED, WITH THE EXCEPTION OF THE STATE ACTION-SPECIFIC REQUIREMENT TO REMEDIATE GROUNDWATER TO BACKGROUND CONCENTRATIONS (25 PA CODE, CHAPTER 75, PART 264). THIS ARAR WOULD BE WAIVED BECAUSE OF TECHNICAL IMPRACTICABILITY. THE CONTINGENT REMEDY FOR GROUNDWATER WOULD ALSO NOT COMPLY WITH THE RELEVANT AND APPROPRIATE SDWA

MCL CHEMICAL-SPECIFIC ARAR. THIS ARAR WOULD BE WAIVED BECAUSE OF TECHNICAL IMPRACTICABILITY IF THE CONTINGENT REMEDY IS ELECTED BY THE EPA IN THE FUTURE. THE OTHER MAJOR ARARS INCLUDE THE FOLLOWING:

ACTION-SPECIFIC ARARS - SOIL/SEDIMENT EXCAVATION ACTIVITIES WILL BE IN ACCORDANCE WITH PENNSYLVANIA REQUIREMENTS FOR EROSION CONTROL (25 PA CODE, CHAPTER 102), AND 40 CFR 264.31. REMEDIAL ACTIVITIES WILL BE CONDUCTED IN COMPLIANCE WITH THE FISH AND WILDLIFE COORDINATION ACT (16 USC 661). THE FIXATION, BIOLOGICAL TREATMENT, AND GROUNDWATER TREATMENT PLANTS WILL BE DESIGNED AND OPERATED IN ACCORDANCE WITH RCRA SUBTITLE C MISCELLANEOUS TREATMENT UNIT STANDARDS (40 CFR PART 264, SUBPART X). THE TREATED SOILS/SEDIMENTS AND GROUNDWATER TREATMENT RESIDUALS WILL BE MONITORED TO ENSURE COMPLIANCE WITH RCRA SUBTITLE C LAND DISPOSAL RESTRICTIONS (40 CFR PART 268) (I.E., TO ENSURE THAT THE TREATED SOILS/SEDIMENTS AND GROUNDWATER TREATMENT RESIDUALS ARE NONHAZARDOUS), PRIOR TO DISPOSAL AT AN APPROVED OFFSITE FACILITY. GROUNDWATER TREATMENT WILL EMPLOY AIR MONITORING AS APPROPRIATE TO ENSURE COMPLIANCE WITH 55 FR NO. 120, JUNE 21, 1990 (PAGE 25454). CAPPING OF MODERATELY CONTAMINATED SOILS/SEDIMENTS ONSITE WOULD BE CONDUCTED TO MEET THE RELEVANT AND APPROPRIATE REQUIREMENTS OF RCRA LANDFILL CLOSURE IN 40 CFR 264.310. MATERIALS TRANSPORTED OFFSITE WILL MEET THE CERCLA OFFSITE DISPOSAL POLICY AND COMPLY WITH FEDERAL TRANSPORTATION REGULATIONS (40 CFR PARTS 262 AND 263; 49 CFR PARTS 107 AND 171-179) AND PENNSYLVANIA REGULATIONS (25 PA CODE, CHAPTER 263) FOR MATERIAL TRANSPORT. DURING CONTAMINATED SOILS/SEDIMENT REMOVAL AND TREATMENT, AIR MONITORING WILL BE PERFORMED TO ENSURE THAT ANY AIR EMISSIONS COMPLY WITH CLEAN AIR ACT (40 CFR PARTS 50 AND 61) AND PENNSYLVANIA AIR QUALITY REGULATIONS (25 PA CODE, CHAPTERS 123, 127, AND 131). OSHA REQUIREMENTS (29 CFR PARTS 1904, 1910, AND 1926) WILL BE MET FOR WORKERS ENGAGED IN REMEDIAL ACTIVITIES. THE OFFSITE LANDFILL ACCEPTING THE TREATED SOILS/SEDIMENTS, UNSALVAGED DEMOLITION WASTE, AND GROUNDWATER TREATMENT RESIDUALS WILL COMPLY WITH RCRA SUBTITLE D AND STATE INDUSTRIAL (SOLID) WASTE MANAGEMENT REGULATIONS. TREATED GROUNDWATER DISPOSAL WILL COMPLY WITH ALL ARARS (E.G., PENNSYLVANIA WATER QUALITY STANDARDS (25 PA CODE, CHAPTER 93) AND PENNSYLVANIA WASTEWATER DISCHARGE STANDARDS (25 PA CODE, CHAPTER 92)). LONG-TERM GROUNDWATER MONITORING IN COMPLIANCE WITH 40 CFR 264.117 WILL ALSO BE CONDUCTED FOLLOWING IMPLEMENTATION OF THE SELECTED REMEDY.

CHEMICAL-SPECIFIC ARARS - RCRA SUBTITLE C AND COMMONWEALTH OF PENNSYLVANIA REQUIREMENTS FOR IDENTIFICATION OF CHARACTERISTIC HAZARDOUS WASTES (40 CFR PART 261 AND 25 PA CODE, CHAPTER 261, RESPECTIVELY) WILL BE COMPLIED WITH DURING THE REMEDIATION OF OU THREE MATERIALS. GROUNDWATER WILL BE REMEDIATE TO THE MAXIMUM CONTAMINANT LEVELS SPECIFIED IN THE SAFE DRINKING WATER ACT (40 CFR PART 141) IF TECHNICALLY PRACTICABLE. AIR EMISSIONS DURING REMEDIAL ACTIVITIES WILL BE MONITORED FOR COMPLIANCE WITH CLEAN AIR ACT (40 CFR PARTS 50 AND 61) AND PENNSYLVANIA AIR QUALITY REGULATIONS (25 PA CODE, CHAPTERS 123, 127, AND 131). CLEAN WATER ACT (40 CFR PART 122) AND PENNSYLVANIA (25 PA CODE, CHAPTER 92) DIRECT DISCHARGE STANDARDS WOULD BE MET BY THE GROUNDWATER REMEDIATION.

* LOCATION-SPECIFIC ARARS - REMEDIATION OF THE CONTAMINATED SOILS/SEDIMENTS WILL BE CONDUCTED IN ACCORDANCE WITH THE FEDERAL FLOODPLAINS MANAGEMENT AND EXECUTIVE ORDER (E.O. 11988).

* OTHER CRITERIA, ADVISORIES, OR GUIDANCE TO BE CONSIDERED- IN DETERMINING ACCEPTABLE SOIL/SEDIMENT AND GROUNDWATER REMEDIAL ACTION LEVELS EPA USED ADVISORY LEVELS AND GUIDELINES THAT ARE "TO-BE-CONSIDERED" FOR THE REMEDIAL ACTIONS. THESE ARE:

* EPA-ESTABLISHED REFERENCE DOSES FOR CONTAMINANTS POSING NONCARCINOGENIC THREATS TO HUMAN HEALTH

* EPA-ESTABLISHED CARCINOGENIC POTENCY FACTOR FOR CONTAMINANTS POSING CARCINOGENIC THREATS TO HUMAN HEALTH

* PROPOSED PRIMARY DRINKING WATER STANDARDS UNDER THE SAFE DRINKING WATER ACT FOR TETRACHLOROETHENE, BENZO(A)PYRENE, INDENO(1,2,3-CD)PYRENE, AND BENZO(B)FLUORANTHENE

THE SELECTED REMEDY WILL ALSO COMPLY WITH THE COMMONWEALTH OF PENNSYLVANIA GUIDANCE DOCUMENT "HAZARDOUS WASTE AND PETROLEUM PRODUCTS CONTAMINATION CLEANUP PROJECTS" WHICH REQUIRES BEST AVAILABLE TECHNOLOGY FOR AIR STRIPPERS AND OTHER EQUIPMENT DESIGNED TO REMOVE VOLATILE ORGANIC CHEMICALS FROM WATER.

THE SELECTED REMEDY SATISFIES THE CERCLA PREFERENCE FOR REMEDIES THAT INCORPORATE TREATMENT AS A PRINCIPAL COMPONENT.

C. COST-EFFECTIVENESS

THE ESTIMATED PRESENT WORTH COST OF THE SELECTED REMEDY FOR OU THREE IS $77,300,000. EPA AND THE COMMONWEALTH OF PENNSYLVANIA BELIEVE THE SELECTED REMEDY IS COST-EFFECTIVE IN MITIGATING THE RISKS POSED BY THE OU THREE MATERIALS IN A REASONABLE PERIOD OF TIME (AN ESTIMATED 5 YEARS FOR THE SOILS/SEDIMENTS) AND MEETS ALL OTHER REQUIREMENTS OF CERCLA. BECAUSE GROUNDWATER CONCENTRATIONS IN THE ENTIRE AREA OF ATTAINMENT WILL BE RESTORED TO HEALTH-BASED LEVELS IF TECHNICALLY PRACTICABLE, THE MAJORITY OF ORGANIC CONTAMINANTS PRESENT IN THE OU THREE MATERIALS WILL BE DESTROYED, THE METAL CONTAMINANTS IN THE GROUNDWATER AND "PRINCIPAL THREAT" SOILS/SEDIMENTS WILL BE TREATED TO REDUCE MOBILITY, AND THE TREATED NONHAZARDOUS WASTES AND DEMOLITION DEBRIS WILL BE DISPOSED IN AN APPROPRIATE LANDFILL (OR SALVAGED, AS APPROPRIATE), THE SELECTED REMEDY AFFORDS A HIGH DEGREE OF LONG-TERM EFFECTIVENESS AND PERMANENCE. ALTHOUGH THE NO-ACTION ALTERNATIVE, THE SOIL CAPPING ALTERNATIVE (ALTERNATIVE 2), AND THE IMPERMEABLE CAPPING ALTERNATIVE (ALTERNATIVE 3) CAN BE IMPLEMENTED AT LOWER COSTS THAN THE SELECTED SOIL/SEDIMENT REMEDY, THESE ALTERNATIVES DO NOT PROVIDE FOR PERMANENT TREATMENT AND ARE NOT AS EFFECTIVE IN PROTECTING HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, THESE ALTERNATIVES DO NOT MEET ARARS. ALTHOUGH THE SOIL FLUSHING PROGRAM (ALTERNATIVE 9) CAN BE IMPLEMENTED AT LOWER COSTS THAN THE SELECTED SOIL/SEDIMENT REMEDY, THIS ALTERNATIVE IS NOT AS EFFECTIVE IN PROTECTING HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, THE ALTERNATIVES DOES NOT MEET ARARS.

THE NO-ACTION ALTERNATIVE, THE PLUME CONTAINMENT ALTERNATIVE (ALTERNATIVE 2), THE EXTRACTION AND TREATMENT OF THE MOST CONTAMINATED GROUNDWATER ALTERNATIVE (ALTERNATIVE 3), AND THE PHASED APPROACH (ALTERNATIVE 5) CAN BE IMPLEMENTED AT LOWER COSTS THAN THE SELECTED GROUNDWATER REMEDY. HOWEVER, THESE ALTERNATIVES ARE LESS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, DO NOT MEET THE MCL ARAR OR CURRENTLY JUSTIFY A WAIVER, AND DO NOT ATTEMPT TO RESTORE THE CONTAMINATED AQUIFER TO ITS BENEFICIAL USES AS SOON AS MAY BE TECHNICALLY PRACTICABLE. THE CONTINGENT GROUNDWATER REMEDY IS LESS EXPENSIVE THAN ALTERNATIVES 3 AND 5, YET MORE EXPENSIVE THAN THE NO-ACTION ALTERNATIVE. HOWEVER, THE NO-ACTION ALTERNATIVE IS NOT PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND DOES NOT MEET ARARS OR JUSTIFY A WAIVER. (IF THE CRITERION FOR ELECTION OF THE CONTINGENT REMEDY IS MET, A WAIVER OF THE MCL ARAR WOULD BE JUSTIFIED.)

D. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

BY TREATING ALL OF THE OU THREE SOILS/SEDIMENTS THAT POSE THE PRINCIPAL THREATS TO HUMAN HEALTH AND THE ENVIRONMENT AND ALL CONTAMINATED GROUNDWATER, THE SELECTED REMEDY ADDRESSES THE PRINCIPAL THREATS POSED BY THE OU THREE MATERIALS THROUGH THE USE OF TREATMENT TECHNOLOGIES. THEREFORE, THE STATUTORY PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT AS A PRINCIPAL ELEMENT IS SATISFIED.

E. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE.

EPA HAS DETERMINED THAT THE SELECTED REMEDIAL ACTION REPRESENTS THE

MAXIMUM EXTENT TO WHICH PERMANENT SOLUTIONS AND TREATMENT TECHNOLOGIES CAN BE UTILIZED WHILE PROVIDING THE BEST BALANCE AMONG THE OTHER EVALUATION CRITERIA. OF THE ALTERNATIVES THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND MEET ARARS, EPA HAS DETERMINED THAT THE SELECTED REMEDY PROVIDES THE BEST BALANCE OF TRADE-OFFS IN TERMS OF LONG-TERM EFFECTIVENESS AND PERMANENCE; IMPLEMENTABILITY; SHORT-TERM EFFECTIVENESS; REDUCTION IN TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT; STATE AND COMMUNITY ACCEPTANCE; AND THE CERCLA PREFERENCE FOR TREATMENT OF THE SOILS/SEDIMENTS AND GROUNDWATER.

THE SELECTED REMEDY AND CONTINGENT REMEDY ADDRESSES THE PRINCIPAL THREATS POSED BY THE OU THREE MATERIALS. THE REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, MEETS ARARS OR A WAIVER IS JUSTIFIED, INCORPORATES TREATMENT AS A PRINCIPAL ELEMENT, AND IS COST-EFFECTIVE. THE MAJOR TRADEOFFS THAT PROVIDE THE BASIS FOR THE SELECTION DECISION ARE LONG-TERM EFFECTIVENESS AND PERMANENCE; REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT; SHORT-TERM EFFECTIVENESS; AND COST.

OF THE SOIL/SEDIMENT ALTERNATIVES WHICH ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT AND MEET ARARS, ALTERNATIVE 5 IS LESS EFFECTIVE IN THE LONG-TERM AND MORE EXPENSIVE TO IMPLEMENT THAN THE SELECTED REMEDY. WHILE ALTERNATIVE 3 IS LESS EXPENSIVE THAN THE SELECTED REMEDY, CONTAMINANT TOXICITY, MOBILITY, OR VOLUME IS NOT REDUCED THROUGH TREATMENT. ALTHOUGH ALTERNATIVES 4A AND 4B ARE MORE EFFECTIVE IN THE LONG TERM THAN THE SELECTED REMEDY, THESE ALTERNATIVES ARE MORE EXPENSIVE TO IMPLEMENT AND CONTAMINANT TOXICITY, MOBILITY, OR VOLUME IS NOT REDUCED THROUGH TREATMENT. ALTERNATIVE 4C IS LESS EFFECTIVE IN THE LONG TERM AND MORE EXPENSIVE TO IMPLEMENT THAN THE SELECTED REMEDY, AND CONTAMINANT TOXICITY, MOBILITY, OR VOLUME IS NOT REDUCED THROUGH TREATMENT. THERE IS LESS SHORT-TERM RISK ASSOCIATED WITH THE SELECTED REMEDY THAN FOR ALTERNATIVE 7 (THERMAL TREATMENT) AND ALTERNATIVE 8 (VITRIFICATION). THESE ALTERNATIVES ARE ALSO SIGNIFICANTLY MORE EXPENSIVE THAN THE SELECTED REMEDY, ALTHOUGH THEY WOULD BE SLIGHTLY MORE EFFECTIVE. THE SOIL FLUSHING PROGRAM (ALTERNATIVE 9) CAN ALSO BE IMPLEMENTED AT A LOWER COST THAN THE SELECTED SOIL/SEDIMENT REMEDY. HOWEVER, IT APPEARS LIKELY THAT THE PROPOSED SOIL FLUSHING PROGRAM WOULD BE IMPRACTICABLY LENGTHY. IN-SITU SOIL WASHING, AS PROPOSED FOR THE FORMER OWNERS, WOULD ALSO HAVE THE ADDED DISADVANTAGES OF POSSIBLE LOSS OF THE LEACHING FLUID TO THE COMPLEX GROUNDWATER SYSTEM. DURING THE 3 YEARS THAT A SOILS REMEDY DECISION WOULD BE DELAYED, GROUNDWATER CONTAMINATION WOULD CONTINUE AND THE POTENTIAL FOR SURFACE RUNOFF CONTAMINATION AND DIRECT CONTACT WITH CONTAMINATED SOILS WOULD CONTINUE TO EXIST. ALTERNATIVE 9 WOULD ALSO NOT COMPLY WITH THE GROUNDWATER MCL ARAR. BASED ON THE ABOVE EVALUATIONS, THE SELECTED REMEDY WAS DETERMINED TO BE THE MOST APPROPRIATE REMEDY FOR THE SOIL/SEDIMENT MEDIUM OF OPERABLE UNIT THREE AT THE WHITMOYER LABORATORIES SITE.

THE SELECTED REMEDY FOR GROUNDWATER IS THE MOST PROTECTIVE OF THE GROUNDWATER ALTERNATIVES, AND IS THE ONLY ALTERNATIVE WHICH COMPLIES WITH THE MCL ARAR. (THIS ARAR WOULD BE WAIVED BECAUSE OF TECHNICAL IMPRACTICABILITY IF THE CONTINGENT REMEDY IS ELECTED BY THE EPA IN THE FUTURE.) OF THE GROUNDWATER ALTERNATIVES, THE SELECTED REMEDY ATTEMPTS TO RESTORE THE CONTAMINATED AQUIFER TO ITS BENEFICIAL USES AS SOON AS MAY BE TECHNICALLY PRACTICABLE. THEREFORE, IT WOULD BE THE MOST EFFECTIVE ALTERNATIVE IN THE SHORT TERM. UNDER ALTERNATIVE 2, OFFSITE GROUNDWATER CONTAMINANT CONCENTRATIONS WOULD INCREASE IN THE SHORT-TERM. FOR ALTERNATIVES 3 AND 5, THE CONTAMINANT PLUME WOULD CONTINUE TO GROW IN THE SHORT TERM. IF THE SELECTED REMEDY PROVES TO BE TECHNICALLY PRACTICABLE, IT WOULD ALSO BE THE MOST EFFECTIVE ALTERNATIVE IN THE LONG-TERM. ALTERNATIVE 2 WOULD BE LESS EFFECTIVE IN THE SAME TIMEFRAME AS THE SELECTED REMEDY, AS MUCH LESS CONTAMINATION WOULD BE REMOVED FROM THE AQUIFER, AND CONTAMINATION WOULD CONTINUE TO MIGRATE OFF SITE AND DETERIORATE OFFSITE GROUNDWATER QUALITY. UNDER ALTERNATIVE 3, THE LESS CONTAMINATED PORTION OF THE PLUME WOULD BE ALLOWED TO EXPAND OVER TIME AND POSE FUTURE HEALTH RISKS. THE FORMER OWNERS STATED THAT ONLY THE MOST HIGHLY CONTAMINATED PART OF THE PLUME WOULD BE PUMPED AND TREATED UNDER ALTERNATIVE 5. APPARENTLY THE LESS CONTAMINATED PART OF THE PLUME

WOULD BE UNADDRESSED BY THE PUMP-AND-TREAT PROGRAM. IF THIS IS THE CASE, THE UNADDRESSED PLUME OF CONTAMINATED GROUNDWATER WOULD CONTINUE TO EXPAND OVER TIME AND POSE FUTURE HEALTH RISKS. UNDER ALTERNATIVE 5, THE GROUNDWATER REMEDY DECISION WOULD BE DELAYED FOR 3 YEARS, WHILE A DECISION ON WHETHER TO ACTIVELY REMEDIATE OR CONTAIN GROUNDWATER IS BEING MADE. DURING THE 3-YEAR PILOT PROGRAM, THE PLUME WILL BE PERMITTED TO SPREAD AND POSE FUTURE HEALTH RISKS. THUS, THIS ALTERNATIVE IS NOT EFFECTIVE IN THE SHORT-TERM. SINCE A FINAL REMEDY WOULD NOT BE SELECTED AT THIS TIME UNDER ALTERNATIVE 5, THE LONG-TERM EFFECTIVENESS OF THIS ALTERNATIVE IS UNCLEAR. SUFFICIENT INFORMATION EXISTS TO EVALUATE THE GROUNDWATER ALTERNATIVES OPTIONS AT THIS TIME. THE REMEDIAL DECISION MAINTAINS THE FLEXIBILITY OF SELECTING A PLUME CONTAINMENT REMEDY IN THE FUTURE IF CLEANING UP THE AQUIFER TO HEALTH-BASED LEVELS PROVES TECHNICALLY IMPRACTICABLE. BASED ON THE ABOVE EVALUATIONS, THE SELECTED REMEDY WAS DETERMINED TO BE THE MOST APPROPRIATE REMEDY FOR THE GROUNDWATER MEDIUM OF OPERABLE UNIT THREE AT THE WHITMOYER LABORATORIES SITE. IF CLEANING UP THE AQUIFER TO HEALTH-BASED LEVELS PROVES TECHNICALLY IMPRACTICABLE, A PROVISION FOR ELECTION OF A CONTINGENCY REMEDY (AND THE WAIVER OF THE MCL ARAR) IS MADE.

#ESC

X. EXPLANATION OF SIGNIFICANT CHANGES

THE PROPOSED PLAN FOR OPERABLE UNIT THREE AT THE WHITMOYER LABORATORIES SITE WAS RELEASED FOR COMMENT IN JULY 1990. THE PROPOSED PLAN IDENTIFIED EPA'S PREFERRED ALTERNATIVE. EPA REVIEWED ALL OF THE COMMENTS SUBMITTED DURING THE PUBLIC COMMENT PERIOD. UPON REVIEW OF THESE COMMENTS, IT WAS DETERMINED THAT NO SIGNIFICANT CHANGES TO THE REMEDY, AS IT WAS ORIGINALLY IDENTIFIED IN THE PROPOSED PLAN, WERE NECESSARY.